

Thesis Project Portfolio

Net-Zero Residence Initiative 2022 Project PV Energy Generation Final Report

(Technical Report)

Hypermasculinity and Space Travel: How the US Space Industry Reflects the State of the Patriarchy from the Cold War to Now

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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Spring, 2022

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Sociotechnical Synthesis

Space Travel, Renewable Energy, and Masculinity: A Sociotechnical Analysis within the Many Forms of Sustainability

The application of sustainability through engineering has been one of the main goals of my education since I first came to UVA. While my technical capstone project and my STS research paper are not directly related, sustainability remained a theme and motivator in my pursuit of both subjects. My technical project was to create a tracking system for a solar panel to move with the sun throughout the day, while my research paper explored the relationship between hypermasculinity and space travel. My research was sparked by my interest in seeing space exploration and climate mitigation efforts continuously pitted against each other. I chose to do a separate topic for the STS paper because I was able to identify a lot more with the discussion around space travel, and my personal interest in space exploration in high school was the first time I considered a career in engineering. I have moved away from that field since, and my research brought a lot of my subconscious thoughts on the topic to light and helped illustrate why I don't identify as much with the field as it exists today.

My technical capstone project is one of three projects that are aiming to convert the reCOVER house at Milton Airfield into a net-zero, off the grid home. The reCOVER house was originally built by the Architecture School as a part of a design competition, and the HVAC, insulation, and energy generation systems are being targeted with this capstone work. The solar tracker consists of a microelectronic system that uses sensors to track the sun and turn the panel, a custom rig that is intended to be mounted on a roof, and the PV system that converts the solar energy into usable electricity. Solar rigs are not new technology, but the amount of increased efficiency paired with the unique rig design built for roof installation will help determine if this

strategy is optimal for energy generation on the reCOVER house. The system was successful in creating an increased efficiency for the panel as compared to a traditional stationary system, though additional testing is needed by future groups.

In my STS research, I compared the space program during the Space Race in the 1960s to the current development with the space industry, and tied those differences to the role of hypermasculinity in society during both of these periods. I used a foundational source that made the connection between masculinity in the sixties in conjunction with three sources that helped piece together the relevant actors within the modern day sociotechnical system. I found that the space industry has remained a representation of crises in masculinity as society continues to shift to be more inclusive, with the use of symbolism in terminology and practice as well as the role of the space industry as within capitalism. I also determined that the alignment of the space industry and environmental movements against each other can largely be attributed to these same factors within toxic masculinity, rather than being a necessity within the field.

While it was not clear in the beginning how these projects would intertwine and enhance each other, the overall theme of sustainability within a sociotechnical system remains.

Sustainability is typically referenced in relation to environmental issues, and while that has a level of application for both topics, sustainability reaches beyond that as a necessity for a sociotechnical system of any size to be able to literally sustain itself. As much as the increased efficiencies created by the solar tracker are beneficial, the ability to create and maintain that system at a larger scale is still largely unsustainable and negates any benefits the technology can bring. A more complex system creates many more opportunities for failure even with just one panel, and the aesthetic impacts of having solar panels mounted at an angle on top of a roof are influential as well. My STS research showed that the current ideals that drive the space industry

are unsustainable as well. The field neglects the climate crisis that the earth is facing, but also holds on to principles of masculinity that society is shifting away from. As the original space program eventually incorporated women and people of color into the program, their current industry will eventually have to make changes as well.

I would like to thank my technical advisor, Dr. Harsha Chelliah, as well as my STS advisor, Professor Kathryn A. Neeley, for their support and guidance throughout the development of this thesis portfolio. I would also like to thank the Department of Mechanical Engineering and the Experiential Learning Fund for providing funding to make the projects within my capstone section possible. I'm thankful to my capstone group for everything they've done to make the project happen, and lastly, to my parents for their endless support and my education.