Thesis Portfolio

Design of an In-Situ Fuel, Oxygen, and Potable Water Supply System on Manned Mars Missions

(Technical Report)

Analysis of The State of The Esports Player in Society

(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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Table of Contents

Sociotechnical Synthesis

The technical report describes the design of chemical processes and operations that may have to take place on Mars in order for a manned mission to be possible. Described in this section is a method to produce enough liquid hydrogen and liquid oxygen fuel to power a rocket for the return to Earth from Mars from materials harvested from the soil and atmosphere on Mars. Carbon dioxide is harvested from the Martian atmosphere where it is then compressed and sent to a CO_2 reducer where it is converted to oxygen gas and carbon monoxide. The oxygen is sent to a storage tank where it is stored as a cryogenic liquid. The carbon monoxide is sent to a Water-Gas Shift reactor alongside water harvested from the martian soil where they are converted to hydrogen gas and carbon dioxide. After a series of separation processes, the hydrogen is sent to a storage tank where it is stored via adsorption to a graphene matrix. Excess CO_2 is recycled, and excess CO is released in a purge stream to prevent build up in the system. The power requirements for the system will be provided by several Kilopower units, which are a combination of solar and nuclear power generation created by NASA.

The STS research paper seeks to analyze the position of individuals who make a living by professionally competing in competitive video game competitions, known as esports. The specific question addressed is “What is the role of the esports player and how should they be regarded in our society and under the law?” The question is addressed through the application of documentary research, discourse analysis, and policy analysis over a framework or social construction of technology. I expect to find explicitly an understanding of the development of the role of esports players to the present, and a sense of where the profession is headed. This can be

significant as a means to understand how novel professions that develop as a result of new technologies affect and are affected by society.

The relationship between the technical and STS sections of my thesis is loose. On the one hand, for the technical section I am designing the chemical processes required for a manned mission to mars. On the other hand, for the STS section I am researching the current state and development of esports. One could say that both topics deal with people doing things that are new and unique. A mission to Mars would be pushing human exploration to a place farther than humans have ever gone before. Esports players are bravely pursuing a career that is still new and ill defined, only popping up in recent years. Both topics are about people pushing the boundaries of what has been done before, a weak connection but it's there. A much stronger connection between the two topics is the motivation behind choosing each one. I chose both the travel to Mars and the STS factors affecting esports players out of personal interest. Simply, I was very deeply interested in both subjects.