Thesis Portfolio

A SPACE-BASED SOLUTION TO IMPROVE ROADWAY SAFETY AND EFFICIENCY IN VIRGINIA: REAL-TIME WINTER WEATHER DATA FOR NAVIGATION

(Technical Report)

AN INVESTIGATION OF THE SOCIETAL BENEFITS OF SPACE EXPLORATION

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

This study consisted of a technical research project and a sociotechnical research project that were mainly concerned with elucidating the various ways in which space technology can be used to solve problems on Earth. The technical portion of this work consisted of the design of a satellite constellation to measure and report adverse winter weather conditions on Virginia's roadways. This project was motivated by the need for more accurate measurements of rain, ice, and snow on busy roadways. The sociotechnical research project consisted of an investigation of how the Apollo program served to both directly and indirectly improve American science, technology, engineering, and mathematics (STEM) education. This inquiry was motivated by my desire to make an argument in support of the utility of space exploration and that future endeavors in space should be pursued.

On the surface level, both projects are interrelated in that they are concerned with using space-based technology to solve an Earth-based problem, ultimately attempting to support the argument that space exploration is beneficial to human life on Earth. What is remarkable about this connection is that it highlights the diversity of problems that space technology is capable of providing solutions to. In the case of weather measurements via satellite imagery, the direct benefits are that roadway users may be safer and more aware of their surroundings while driving. In the case of the Apollo program improving American STEM education, one of the benefits was that a new generation of students were inspired to pursue a career in STEM and develop technologies that have been transformational in society. This work clearly demonstrates the potential positive outcomes of continuing to develop and use technology beyond the confines of Earth's atmosphere.