**Thesis Project Portfolio**

# A Space-Based Solution to Improve Roadway Safety and Efficiency in Virginia: Real-Time Winter Weather Data for Navigation

(Technical Report)

# The Dangers of Speeding: Why an Ethical Approach to Speeding Education is Superior to the Current Consequential System

(STS Research Paper)

An Undergraduate Thesis

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

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In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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**Sociotechnical Synthesis**

(Executive Summary)

*Changing Mindsets to Make Driving Safer*

In 2019, there were 39,107 people killed in automobile accidents. The loss of life is due to a variety of reasons, such as drunk driving, speeding, inclement weather, and distracted driving. Both of my projects focused on a way to help make driving safer for all drivers by mitigating two different causes. For the technical project, my team and I developed a cube-sat that was capable of identifying snowy, icy, or rain covered roadway and distributing this information to emergency personnel and navigation apps like Google Maps and Waze. My STS research focused on the problems of the system in place used to prevent speeding in the United States.

With my technical project being a satellite, taking images of the road and identifying what condition the roads were in posed a great challenge due to cloud coverage and keeping the data near real time. A camera is used to take an image in the 0.4 to 0.7 micrometer spectral band range. In this range, the reflectance of the clouds and roadways are varied enough that a difference can be seen. This data is then processed through the onboard computer and sent to a ground station located at UVA using S-Band frequencies. Once the data is on the ground it can be sent out to emergency personnel and navigation apps for all users. With information of the roadway conditions, drivers can be safer on the road.

In my STS research, I looked at how drivers in the United States view speeding and the system that is put in place to prevent it. Slovic (2010) discusses how people can have a varied perception of risk depending on their background and life events. My analysis of the current system in place in the US discovered that the current methods put little effort into prevention and

focus heavily on repercussions. I was able to identify that many drivers do not view speeding as a danger to other people, but only themselves. So, with drivers not considering other people and the current system being repercussion based, drivers are more comfortable speeding.

My STS and technical research projects combined to illustrate how several different factors contribute to the risks that come with driving. The data gathered from the technical and cultural viewpoints showed that simply making drivers aware of risks. People's thought process on hazardous conditions and speeding needs to be completely redesigned. Similarly, there was a Boeing Max 737 pilot who encountered the problem on a previous flight and new immediately how to fix it. There are protocols in place where he should have submitted a report on the error encountered and how he solved it. However, he simply reported that there was a problem, not taking the time to include the solution. If he had considered the danger others might be in by him not reporting the solution, many lives could have been saved. And by applying this approach to drivers, everyone could be more aware of their surrounding and think before they make any potentially deadly decisions.