

# **Thesis Project Portfolio**

## **Student Researched and Developed High Power Rocket**

(Technical Report)

## **How Can Technologies Born from War Provide Lasting Benefits to 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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## **Executive Summary**

### Introduction

My STS Thesis and Capstone project are not related, only in the fact that both link directly to what springs to mind when the phrase “Aerospace Engineer” is said.

My thesis discusses war born technologies and how they have changed their uses over time. The reasoning behind this is to prompt engineers to take a wider look at how their technologies (or aspects of them) may be used for ‘the greater social good’ rather than one singular purpose.

### Capstone Summary

The capstone project is building a rocket as a group of roughly 30 students, split into teams for the Structures, Mechatronics, and Propulsion aspects of design. My specific role was to design, adapt and manufacture the nose cone of the rocket, along with two teammates. We iterated through multiple designs of nose cones using computational fluid dynamics (CFD) software before deciding on an Ogive shape based on the lowest drag profile for our target velocity. The next step was to discuss materials; we decided on a primarily carbon fibre reinforced polymer (CFRP) body, bound together with Epoxy Resin. The manufacturing of the part was done by hand in the basement of the Mechanical and Aerospace Engineering building on grounds, soaking each layer of CFRP in the Epoxy before laying them onto a male ‘plug’ of 3D printed ABS plastic.

### Thesis Summary

The paper discusses the implications of the technological advances during wartime and their effect on wider society – both contemporary and in the future. This topic is often seen as controversial – exploring the benefits of a form of extreme and widespread suffering, but it is a topic that is often

overlooked. In order for this topic to be examined, the STS framework of technological determinism will be used. Simply put, this is the belief that societal advances are caused by technology rather than by other means. The research itself is expected to show that war can invertedly provide some benefit to societies globally and for future generations as well. While this is not used to condone war (or any act that contradicts local and international law) it does have implications for the wider field of STS – namely, that one must look to the potential secondary or tertiary uses for a technology during research and development, as both positive and negative uses may arise.

### Reflection

By doing both these projects simultaneously I learned about adapting my skills in a workplace. Our capstone team is set up like a project team in an engineering company and I was able to take the premise of adapting skills and thought between technologies (from the STS Paper) to the team, allowing me to think outside of the box – finding alternate ways to approach a project. For instance, using a slightly unconventional method for the CFRP laying, by using technologies not primarily intended for that purpose but with the ability to complete the task with adequate safety and structural stability.