

Thesis Project Portfolio

Design and Construction of Modern University of Virginia Themed Pinball Machine

(Technical Report)

The Military Industrial Complex in Higher Education

(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, 2024

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Table of Contents

Executive Summary

Design and Construction of Modern University of Virginia Themed Pinball Machine

The Military Industrial Complex in Higher Education

Prospectus

Executive Summary

How are pinball machines and the Military Industrial Complex related? For my technical report, I investigated the mechanical properties of a pinball machine to generate a modern solution for older mechanisms. This allowed me to apply my undergraduate education to a project that encapsulated a variety of knowledge. However, as for my STS thesis, I explore the Military Industrial Complex (MIC) within higher education and how defense jobs use new technologies to recruit new college graduates. Military presence at colleges and universities has proven itself to be prevalent, and I wanted to take a deeper dive into that phenomenon. Although these two ideas seem unrelated, they play a crucial role in student learning and engagement in my field. As a mechanical engineering student at this university, we are taught to be the innovators of the future, and the department of defense capitalizes on that. The technology I use to build a pinball machine from scratch could be used to build arms for the state.

In my technical report, we studied the current technologies used to make pinball machines. Most of the components use mechanical mechanisms that require extreme amounts of power and are not efficient for current times. There is a lack of control in power usage as well as risks for fires and burnout in the machines. For our project, we replaced these components with modern technologies in attempts to build a UVA themed pinball machine. We wanted the machine to have a 20th century feel with 21st century instruments. We did this by creating our own solenoids, drop down targets, and motorized rotating targets.

Unfortunately, we were unable to finish the project. However, we did develop prototypes to these problems. We created mechatronic systems to roll our own solenoids, used linear actuators to modernize drop down targets, and developed a motorized system to “randomly” rotate the rotunda. These solutions allowed us to meet our goal of improving the pinball machine and advance our knowledge as new engineers.

For my STS research, I wanted to explore how the military uses new technology to recruit new college graduates. However, I wanted to investigate this experience from a student and faculty lens. In my

four years here, I have seen a multitude of defense fliers and career booths around Engineer's Way. This familiarity sparked my interest in exploring the topic. I wanted to know who were these students taking these jobs, and how were they convinced to work for such an entity? I interviewed students and faculty in schools across Virginia to see if this phenomenon was unique to UVA.

It was interesting to find that students and faculty shared similar experiences. Some professors even recalled times in graduate school where they saw the military developing questionable technologies and worried about the work their university was willing to research. One student even felt lied to by the Reserves but could not afford leaving because college was too expensive. Overall, the common consensus was the lack of information given. Many of the people I interviewed felt in the dark about what they were doing or going to do.

When it comes to developing modern solutions, pinball machines and the MIC seem to have similar goals. Both require extensive knowledge and somehow uses technology to influence new college graduates to work on and for them.