

Thesis Project Portfolio

Hoo-Rizon 1: Subscale Sounding Rocket

(Technical Report)

Painted in a Different Light: How Military Contractors Use Civilian Applications to Garner Support

(STS Research Paper)

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Executive Summary

The technical work and STS research are interconnected, as both domains explore technologies that can be utilized for military and civilian purposes. For example, a sounding rocket's main purpose is to collect atmospheric measurements such as altitude, pressure, and temperature during flight. However, the skills and knowledge acquired from this project could also be applied to developing faster and more accurate missiles. This duality reflects differing goals and ideals, with R&D for one potentially benefiting the other. The capstone project operated on a budget of \$200 per person, underscoring how inexpensively dangerous technologies can be created. Furthermore, this illustrates how similar technologies developed with a higher cost, along with the military budgets they stem from, may reflect a greater potential for harm.

The capstone project aimed to design, build, and fly a single-stage, subscale sounding rocket with the goals of reaching a target altitude of 3,000 feet, recovering the rocket, and acquiring atmospheric data. Throughout the year, design reviews were conducted to demonstrate progress to advisors. Design requirements were based on the Tripoli Rocketry Association's guidelines and the team's objectives. The rocket launched on April 5th; however, an electronics issue with parachute deployment resulted in no recoverable data. Despite this setback, valuable insights were gained in problem-solving, structural analysis, and control systems, laying the groundwork for future sounding rocket projects.

The research paper explores the intricate relationship between military technologies and their civilian applications, highlighting the instances in which these technologies successfully transitioned into civilian use, as well as cases where they have not. It evaluates whether funding obtained under the pretense of benefiting civilian society truly fulfills that promise after initially serving military purposes. The study delves into the use and ethics of common appliances with

military origins, as well as emerging dual-use technologies, such as Spot from Boston Dynamics and the Vision 60 Q-UGV from Ghost Robotics, examining their functionalities and the implications of their origins. The paper posits that the promotion of military technologies integrating into civilian sectors serves as a strategic means to garner public support for defense budgets. A sociotechnical systems framework is employed to analyze how societal perceptions of a technology can influence its development and how new technologies can impact society. Ultimately, this paper aims to contribute to the ongoing discourse surrounding the advancement of military technologies and their ethical considerations, which vary based on the technology's utility in different markets.

Working on both projects concurrently was interesting, as the STS research challenges the goals of the capstone project. While the capstone project focuses on building a low-cost rocket, the research raises caution against the development of technologies that can be easily weaponized. Although it may seem contradictory to raise this caution while creating a rocket with the potential for weaponization, it is essential to distinguish between products that can be militarized and those actively used for military purposes. All products have specific design intents, and this research advocates for properly discussing and maintaining those intents when designing and commercializing new technologies. This is especially pertinent in the context of technologies with dual-use military and civilian applications, as their goals can differ significantly. Ultimately, integrating ethical considerations into technological development is vital for promoting responsible innovation.