

Thesis Project Portfolio

HEDGE Hypersonic ReEntry Deployable Glider Experiment Critical Design

(Technical Report)

Analysis of US Hypersonic Spending

(STS Research Paper)

An Undergraduate Thesis

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

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Sociotechnical Synthesis

Hypersonic conditions are challenging to replicate in a simulation such as computational fluid dynamics simulation or a hypersonic wind tunnel. Currently, real world hypersonic testing is extremely expensive. The purpose of our capstone research through our CubeSat called HEDGE, Hypersonic ReEntry Deployable Glider Experiment, offers the ability to conduct hypersonic testing at an extremely low cost compared to traditional programs. We are designing a CubeSat, a small satellite that can be launched relatively inexpensively and designed with many commercial off the shelf parts, that reenters the atmosphere from extreme low earth orbit (ELEO) and reaches hypersonic speeds during reentry. During this hypersonic phase, HEDGE will collect temperature data from material panels, and pressure data from the flow and transmit the data to the iridium satellite constellation which can then be downloaded from the internet. HEDGE is a proof of concept mission to determine the feasibility to using low cost CubeSats for sustained hypersonic flow data. It is important to examine the social and human aspects of this technology. Hypersonic aircraft mainly have military applications and it is important to understand the financial impacts as well as strategic impacts this technology will have on the military. Hypersonic testing is extremely expensive so determining if their high cost is outweighed by their strategic benefit is important for the DOD to understand. There are three different frameworks to analysis this topic in. First the social construction of technology (SCOT), deterrence theory, and a cost benefit analysis. These three theories provide the social aspect, financial aspect, and strategic aspect of hypersonic weapons. Through this research I will determine if the amount the US spends on hypersonic weapons is correct. I will decide if more, less, or the same amount of spending would be best to support US strategic goals, provide adequate deterrence, and also allow the DOD to spend its budget in an effective and efficient

way. My capstone project will hopefully provide a way to conduct hypersonic testing at a low cost allowing the US military to save money. Military spending is the highest its ever been; however, global tensions are also the highest they have been since the cold war. Finding ways to maintain our technological edge, while also reducing spending is becoming increasingly important.