

Thesis Portfolio

HEDGE: Hypersonic ReEntry Deployable Glider Experiment
(Technical Report)

Gold and Glory: 21st-Century U.S. Space Exploration
(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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Thesis Prospectus

Sociotechnical Synthesis

This thesis portfolio aims to provide clarity into modern spaceflight by examining the design of a hypersonic glider and detailing the evolution of the spaceflight industry in the United States. Though both the technical report and the thesis deal with modern spaceflight, the technical report focuses on the design and deployment of a specific instance of current spaceflight technology, while the thesis analyzes the role of society in shaping human spaceflight technology through shifting political, economic, and social climates.

Hypersonic flight data is notoriously difficult to acquire, in addition to be unreliable. The technical project was pursued to assess the feasibility of using CubeSats as hypersonic test vehicles. The technical report provides a mission overview, mission architecture and concept, conceptual design, schedule, and cost for a CubeSat designed to glide and collect flight data at hypersonic speeds in the upper atmosphere. A strong measure of feasibility is whether the CubeSat is able to collect data well, and how costly the vehicle is; for this project, the upper limit on total cost was \$67,722. An additional objective of the project was to facilitate the learning and development of future engineers in the University of Virginia undergraduate Mechanical and Aerospace Engineering program.

The thesis analyzes the evolution of the human spaceflight industry in the 21st century, and, more specifically, how advocates of human spaceflight have furthered their agendas. To understand this, it delves into the beginnings of the major participants in the industry, including the National Aeronautics and Space Administration, the United States Department of Defense, and private firms like SpaceX. This is done within the Social Construction of Technology framework, which emphasizes the interactions between diverse participants as catalysts for technological development. These participants and their values, interests, problems, and

solutions are discussed. The analysis finds that the decentralization of the space industry has allowed for exponential growth in human spaceflight capability, but will present new problems as societies advance into the future.