**Thesis Project Portfolio**

# HEDGE: Hypersonic ReEntry Deployable Glider Experiment

(Technical Report)

# Hypersonic Transport Vehicles for Commercial Applications

(STS Research Paper)

An Undergraduate Thesis

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

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## Table of Contents

## Sociotechnical Synthesis

The purpose of this thesis portfolio is to discuss hypersonics in both a social and technical perspective. In a technical context, this paper proposes a critical design review of a mission proposal in which a CubeSat reenters Earth's atmosphere at hypersonic speeds to gain valuable and unprecedented data. In a social context, this paper explores the emergence of hypersonic vehicles for commercial applications and its potential implications on society.

Hypersonics is an emerging area of research in the aerospace engineering sector. Hypersonic flight data is very difficult to acquire because of its harsh test conditions. As a result, existing data has been extremely expensive to acquire, needing advanced aircraft capable of reaching hypersonic speeds to carry out the data collection. The proposed experiment, Hypersonic ReEntry Deployable Glider Experiment, or HEDGE for short, aims to tackle this issue by using a CubeSat instead of an aircraft to provide a more affordable platform for hypersonic experiments. The CubeSat will launch from a rocket, deploy at extreme low earth orbit, naturally deorbit, and reenter the atmosphere at hypersonic speeds. Data can then be collected until the vehicle naturally burns up due to the heat caused from such high speeds.

Hypersonics has typically been used for military and defense applications. However, hypersonic vehicles for commercial applications are currently in development. Hermeus, a startup company based in Atlanta, Georgia, is the only company working on developing a commercial aircraft capable of traveling at over 5 times the speed of sound. Since there is little precedent on commercial airliners traveling at these speeds, the purpose of this section of the portfolio is to discuss the potential societal implications and to assert whether or not hypersonic commercial aircraft are a net positive on society and if they are worth pursuing in their technological development.

Hypersonics is a very compelling area of research because it has only existed for less than 100 years and there is still very much society does not know about this subject matter. It is important to take equal consideration of the technological advancement of hypersonic as well as its implications on society. This thesis presents a feasible platform to collect hypersonic flight data while also taking a deep look into the societal effects of a hypersonics project in a larger scale.