

HYPERSONIC REENTRY DEPLOYABLE GLIDER EXPERIMENT

HOW PUBLIC RESPONSE IMPACTS A TECHNOLOGY'S PATH OF INNOVATION

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By

Avery Goldberg

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SOCIOTECHNICAL SYNTHESIS

As groundbreaking and cutting edge technology is developed, it is crucial to remember the importance of how the technology is perceived. The Hypersonic ReEntry Deployable Glider Experiment (HEDGE) aims to demonstrate the feasibility of using CubeSat technology for extremely low cost hypersonic testing. The presence of hypersonic aircraft and weapons is growing in the aerospace and defense industry as the United States works to keep up with its competitors but developing this technology is expensive; finding ways to lower the cost of this development will allow production to increase and make room for a potential emergence of hypersonic technology in the public sector. The Actor-Network Theory can be used to investigate how public response impacts a technology's path of innovation, providing insight for future engineering projects. These two topics are connected through the application of the STS topic for the technical topic. In order to make decisions that will support the success of hypersonic engineering projects, it is key to understand the role that public response will play.

Hypersonic testing is prohibitively expensive, making tests are infrequent and progress slow in its technological area. CubeSats, a type of very small nanosatellites, are relatively inexpensive and simple to produce. CubeSats are easily launched and can be managed by teams of amateurs, like the aerospace engineering students at the University of Virginia working on HEDGE. For this project, six functional teams of students work together to design and launch a CubeSat that will orbit in a hypersonic vehicle configuration, collecting temperature and pressure data. This proof-of-concept project will demonstrate the feasibility of using CubeSat technology for extremely low cost hypersonic testing. If this experiment is successful, the process of testing hypersonic vehicles could become drastically more accessible and inexpensive which would lead to faster progress.

HEDGE is an ongoing project, spanning from Fall 2021 to Spring 2025, meaning there are no conclusive results yet. However, up to this point, there has been significant progress in the planning stage. The final deliverable in Spring 2023 is a critical design review which has a fully planned design for the project. The Structures and Integration, Software and Avionics, Power and Thermal and Environment, Communications, Attitude Determination and Control Systems and Orbits, and Program Management teams have produced a design for all aspects of the mission. At this point, the project is on schedule and on track for success with the next steps being prototyping and manufacturing.

Perception of a technology plays an important role in its development yet it is often ignored when technology is being developed. This idea yielded the research question, “How does public response impact a technology’s path of innovation?”. The Actor-Network Theory will be applied to the Concorde, the first supersonic commercial passenger carrying aircraft, as a case study to examine how the different actors contributed to the failure of the technology when it was decommissioned. This exploration will prove the hypothesis that public perception of a technology is the most significant actor when introducing a new technology.

The Concorde aircraft flew from 1976 until 2003 when they were decommissioned. Over the years that Concorde was in use, the perception of the technology grew increasingly worse as problems became clear: noise pollution affected those near where Concorde aircraft flew, the cost of fuel needed to power the aircraft was greater than the profits made, a crash of one of the planes in 2000 incited fear in the public. With each problem came a drop in the positive perception of Concorde, each drop led to actions taken by the various actors involved such as the people living near Concorde’s flight sites, local legislators, and, eventually, national legislators and the manufacturers and distributors of Concorde aircraft. When the Actor-Network Theory

was applied to this case study, the aforementioned evidence pointed to the perception of Concorde as the key actor in bringing about the downfall of the Concorde technology.

Technology can seem very removed from the general public, especially from those who do not directly interact with the technology. The Actor-Network Theory applied to the Concorde case study demonstrates that if the public perception of a technology is negative, the technology can fail without ever directly interacting with the public. When working on hypersonic technology, it is important to use this lesson to ensure the success of the technology by considering what the public response to the technology may be before it is introduced.

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Technical advisor: Christopher Goyne, Department of Mechanical and Aerospace Engineering

HOW PUBLIC RESPONSE IMPACTS A TECHNOLOGY'S PATH OF INNOVATION

STS advisor: Catherine D. Baritaud, Department of Engineering and Society

PROSPECTUS

Technical advisor: Christopher Goyne, Department of Mechanical and Aerospace Engineering;

STS advisor: Catherine D. Baritaud, Department of Engineering and Society