

Thesis Project Portfolio

AIAA HDI-25 Aircraft Design Unmanned Homeland Defense Interceptor Critical Design

(Technical Report)

Care Ethics Analysis of Boeing 737 Max 8 MCAS Failures

(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

William Walker Couch

Spring, 2025

Department of Mechanical and Aerospace Engineering

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Sociotechnical Synthesis

My technical project and Science, Technology, and Society (STS) research both focus on aviation safety. The projects are different in how they go about ensuring safety. My technical project goes about creating aviation safety by protecting the skies from adversaries. My STS research focuses on ensuring aviation safety by keeping passengers safe from unethical business practices. These projects give two different ways of viewing aviation safety, and they give a larger breadth of perspective in the field of aeronautical design and engineering.

The American Institute of Aeronautics and Astronautics (AIAA) releases annual requests for proposal (RFPs). My capstone team competed in the 2025 Undergraduate Team Aircraft Design Competition. The RFP laid out requirements for a remotely piloted low-cost transonic interceptor aircraft to protect the United States from its adversaries. A few major requirements were a maximum flyaway cost of \$25 million per unit, with an order of 1000 units, a maximum speed of at least Mach 1.6 at sea level conditions, and the aircraft must be remotely piloted. Our team ended with a design that came in below the \$25 million dollar budget. In the past, aircraft design was popular at UVA, but due to diminishing interest, UVA did not have a capstone team for aircraft design last year. We hope that our work will revive UVA's legacy as a prominent figure in the university aircraft design competitions, particularly in AIAA competitions.

My STS research project also analyzes aircraft design by examining the case of the MCAS failures of the Boeing 737 Max 8. This case presents a design failure resulting from a very poor company culture, which resulted in the deaths of 346 people. Existing literature had consistently claimed that The Boeing Company acted unethically, with its introduction of MCAS. However, existing literature provided no reason for why Boeing's actions were

unethical. My research fills this gap by using the ethical framework of care ethics. Care ethics accounts for power imbalances in relationships, which allows one to make the claim that Boeing, the actor with more power, had the obligation to keep its passengers and pilots safe. I claimed that Boeing's disregard for the safety of its passengers and pilots was unethical due to their underlying obligation of care.

I feel that working on both projects gave me a much deeper understanding of the impact of my capstone and future work. The Boeing MCAS failures were the result of one angle of attack sensor. One sensor failed twice and killed 346 people. There were other problems with the Boeing case, but that was the root cause. This really puts into perspective how important every part of an aircraft is, as one failure can claim many lives. This research reinforced the importance of safety factors and redundancy in engineering design. Risking public safety, especially as a cost cutting measure, is not an option.