

Thesis Project Portfolio

Unmanned Homeland Defense Interceptor

(Technical Report)

The Influence of American Warfare on Modern Day Aviation and Aerospace Technology

(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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Spring, 2025

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Executive Summary

Throughout American history, military conflict has often driven major technological innovation. My capstone project explores a low-cost, autonomous military fighter jet designed to reduce both financial and human costs compared to fifth-generation aircraft. In parallel, my STS research investigates how American warfare has historically shaped the development of aviation and aerospace technology. Together, this research examines the cycle of defense driven innovation and how future designs, like the Homeland Interceptor jet, can carry that legacy forward in a sustainable way.

My technical project involves designing an autonomous, low-cost military fighter jet capable of competing with fifth-generation aircraft, while maintaining a unit cost of \$25 million per aircraft. As defense tactics continue to evolve, the United States Air Force is constantly testing the battlefield with new, innovative designs. This project aims to demonstrate that affordable alternatives exist. Solutions that can not only match the performance of current aircraft but also eliminate the need to place pilots in harm's way. That's why my design for an autonomous homeland interceptor is critical. It not only seeks to reduce costs for the American taxpayer but also aims to protect the lives of American pilots.

The design demonstrates that a capable air-to-air interceptor can be created using lightweight materials, efficient propulsion systems, and innovation of all subsystems. Reducing dependency on expensive fifth-generation systems like the F-35 and F-22, while still accomplishing the same missions is of the utmost importance. With current technology and innovation, it is clear that many missions that are performed by manned jets can be transitioned to remotely piloted or autonomous systems without sacrificing effectiveness. This approach reduces long-term maintenance costs and a more sustainable financial budget.

My STS research complements my technical project and aims to explore how American warfare has influenced the development of modern aviation and aerospace technology. Since the Wright brothers' first flight in 1903, aviation has become a key component of American military power. With each major conflict, the aerospace industry has undergone rapid technological advancement. Investigating how American warfare has directly influenced aviation and aerospace technology is essential to understanding how engineering decisions in both military and civilian sectors drive innovation across the industry. I used case studies supported by primary and secondary sources including DoD articles, engineering analyses, and academic literature. I employed the Social Construction of Technology (SCOT) framework to show how social and institutional factors, like defense contractors, government agencies, and national security priorities shape the development and trajectory of aerospace innovations.

My research reveals a consistent trend that significant technological advances in aviation have been credited to American conflict. Technological advancements such as jet propulsion,

stealth technology, ballistic missile systems, and unmanned aerial vehicles, many of which transitioned into civilian applications. I conclude that while warfare has historically driven aerospace innovation, it also raises ethical, regulatory, and sustainability challenges that engineers must confront. This research argues that understanding this dynamic is essential for responsibly guiding future advancements.