

**Thesis Project Portfolio**

**AIAA 2020-2021 Undergraduate Capstone Project**

**Austere Field Light Attack Aircraft**

(Technical Report)

**The Effect of PTSD on Light Attack Aircraft and Unmanned Aerial Vehicle Pilots**

(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

David Gibbs

Spring, 2021

Department of Aerospace Engineering

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## **Sociotechnical Synthesis**

In an ever-developing aerospace technology, realm pilots have had to control many diverse aircraft platforms, which lead to uncharted human experiences. The design of these aircraft primarily focuses on the mission profile at need. With advancements in technology, some mission profiles do not need pilots present in the cockpit, like unmanned aerial vehicles (UAVs), yet they have very similar posttraumatic stress disorder (PTSD) risk factors as conventional pilots.

My capstone group completed a light attack aircraft (LAA) conceptual design for the 2021 American Institute of Aeronautics and Astronautics (AIAA) competition. Their request for proposal (RFP) consisted of baseline qualities our conceptual design must meet along with two mission profiles. Our group of seven took on specialties within the scope of the project, I took lead on the CAD modeling using SolidWorks. Through an iterative design process, we achieved all the requirements in the RFP. Ultimately leading to an aircraft configuration powered by two turboprops, a T-tail empennage configuration with a low-mounted main wing.

Considering my capstone research dealt with conventional pilots who carry out missions in combat zones that influenced my STS research to investigate how PTSD is manifested through diverse experiences stemming from UAV and conventional pilots. Starting in the early 2000s, after the first UAV strike was carried out in Afghanistan, the United States has utilized these aircraft extensively. However, little research was done prior on how this affected UAV pilots. Since then, studies have been conducted to examine how susceptible UAV pilots are to PTSD symptomology. Consequently, leading to factors such as strenuous work schedules,

observing aftermath surveillance of strikes all while being stationed in the United States with everyday stresses lead to higher susceptibility of PTSD.

Both my capstone and STS research taught me very different but necessary lessons. First, my capstone taught me the iterative process of designing something from scratch as well as working effectively online with seven people due to the pandemic. Additionally, I learned that aircraft design is never complete, there is always more testing to be done. My STS research helped to the personalized quantitative aspects of aerospace engineering making me realize the importance of thinking through all affected areas of an invention. Following my STS research, there is still work to be done on the support systems UAV pilots should have considering they are equally susceptible to PTSD as conventional pilots.

I would like to thank Prof. Quinlan for his guidance and expertise in completing our capstone, along with my six other teammates that made this a very educating and enjoyable two-semester project. Finally, I would like to thank Prof. Ferguson for his support these past two semesters with helping me appreciate engineering for all the effects it has on the world.

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

Prof. Quinlan, Department of Aerospace Engineering