Thesis Project Portfolio

AIAA 2020-2021 Undergraduate Aircraft Design RFP

Austere Field Light Attack Aircraft

(Technical Report)

Defining a Light Attack Aircraft and Understanding This Aircraft's Position in the Military

(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, 2021

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Sociotechnical Synthesis

(Executive Summary)

Designing a Light Attack Aircraft and How it Fits into the Military

The American Institute of Aeronautics and Astronautics (AIAA) releases design challenges for college undergraduate and graduate teams based on trends in the current aircraft. Through this, my Aircraft Design capstone team was tasked with creating a light attack aircraft from scratch and presenting it to the organization. The world of attack aircraft open up multiple avenues for STS research but after learning more and more about specifically the light attack aircraft, the question that stood out was: Why is it not used very often? There are currently two of these aircraft being used by the military however they almost never are used in combat scenarios.

The technical portion of my thesis produced a new design for a light attack aircraft. Our class split into teams of seven and our team decided to design a tilt-wing configuration with turboprop engines. Specifically, I was focused on the propulsion and rotors of the aircraft. The engine was chosen to be the GE T-700 based on information gathered and engine sizing done through textbook methods. Once this was done, the engine data gathered was taken and used to produce a specific rotor airfoil that allows the engine to create the amount of thrust needed for the aircraft to be able to lift off from the ground vertically from the ground at 60% payload capacity and use angled wings for short take off utilization for full payload.

In my STS research, I studied why the light attack aircraft were not often utilized and what their place is in the US military. Utilizing actor network theory, I was able to discover the actors that go into the utilization of aircraft in battle scenarios. Understanding these connections

leads to more understanding about why the aircraft are not utilized, and can give insights on how this may change. I concluded through my research that while the light attack aircraft are capable fighters, they are not utilized simply because it is expensive to produce them as well as they have limited armor and a lower speed than many other planes causing them to be more susceptible to fire from the enemy. In current times, it is worth the extra money spent in operating costs to send the heavier equipped fighter to support ground troops. This showed that the place of the light attack aircraft currently is as a trainer plane.

The understanding of light attack aircraft I gained from designing one gave me a very realistic understanding of what the capabilities of these planes are. This understanding allowed me to effectively produce the comparisons between the light attack aircraft to current fighter jets and attack aircraft as well as a detailed map of what actually goes into these planes for my STS paper. This research gave me multiple opportunities to learn to skim technical papers effectively to get the needed information as well as understanding how something of this magnitude would effect the common person.

I would like to acknowledge Dr. Jesse Quinlan and my capstone group for assistance with my technical topic, as well as Dr. Kathryn Neeley for her assistance with my STS research.