

Thesis Project Portfolio

Project Kestrel: Light Attack Aircraft Design Proposal

(Technical Report)

The Growing Priority of Sustainable Design, and the Engineer's Role in Promoting a Sustainable Future

(STS Research Paper)

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Sociotechnical Synthesis

In the realm of researching and developing new technologies for military application, one of the key pillars is to always be proactive in creating new designs and solutions rather than reactive. Paradigms of warfare and the needs of soldiers on the frontline can change suddenly and drastically, and waiting for problems to arise is a recipe for unneeded losses and lost initiative on the battlefield. As such, for military planners, scientists, and engineers, of equal importance to responding to current tasks and challenges is looking ahead to the future, and innovating in the aim to address future needs before they become problems. It is in this vein of solving future problems in the present that my technical capstone project is rooted. For this project, the capstone team was tasked with designing an affordable light attack aircraft capable of operating from austere frontline conditions. This aircraft design needed to fulfill several design missions and performance metrics, with the main goal being to design an innovative platform capable of performing the types of missions currently only done by attack helicopters, while improving on many of the weaknesses of modern helicopters. The team tackled this challenge by creating a unique tilt-wing aircraft, which we called the Kestrel, whose innovative design and features provided an effective and original solution to the design challenge.

Meanwhile, my STS thesis paper focused on the rising prominence of sustainable engineering in the modern era, and aimed to explore the role engineer's play in embracing and interacting with sustainable design. When the Industrial Revolution came into full swing by the mid 1800's, it led to a myriad of monumental shifts in manufacturing, engineering, and business. Many of these evolutions reaped massive benefits for human society, but it also established precedents which we are now working to rectify. One such precedent is the traditional model of engineering design, a straightforward process focusing only on the immediate technical

challenges of a project, ignoring the broader context and future ramifications of design decisions in favor of instant gratification. As awareness about the importance of environmental health and sustainability has grown significantly, a new model for guiding the engineering process has been introduced, referred to as sustainable engineering. Using the paradigm shift framework, the factors which have led to the ongoing transition from traditional to sustainable engineering are illuminated, along with the ramifications of this shift on engineers and other relevant stakeholders. Furthermore, through analysis of existing literature and case studies, the role of the engineer within the greater context of sustainability and engineering will be explored, leading to a stronger understanding of how engineers are both empowered and hindered from promoting sustainable design.

At first glance, environmental awareness and sustainable design might not seem overtly connected to my technical capstone project; however, it was in fact this lack of an obvious link that inspired my STS topic. Early on in the design process for the technical project, the team spent several weeks pouring over the request for proposal (RFP) and deliverables, analyzing the major design goals and performing initial concept exercises to determine how best to address those goals. The RFP was quite thorough in what was required for the final deliverable, including details on flight characteristics, cost breakdowns, service life, and other factors. These were all well within expectations, but what stuck out to me was the lack of any mention of environmental or sustainability concerns in the design. As someone with a major interest in sustainable design and the effects of modern industry on the planet's health, this exclusion from the RFP definitely grabbed my attention. While I believe it is fair to assume that a fair extent of this omission can be attributed to the military nature of the project, it nevertheless got me

thinking about the complex and evolving relationship between engineers, contractors, and sustainability, which ultimately led to the formulation of my STS research topic.