

Thesis Project Portfolio

**Systems Analysis and Negotiation of Strategic Partnerships in the Supply of Biofuels to
Commercial Aviation**

(Technical Report)

**Using Duty Ethics to Examine the Use of One-Way Drones
by Russian Ground Forces in the War in Ukraine**

(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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Sociotechnical Synthesis

My technical work and my STS research projects are related as they apply to the aviation industry and evaluate how new technologies are disrupting conventional technological applications. The technical paper uses a systems engineering approach to examine synthetic aviation fuel pathways for the local region, assess stakeholders, and consider potential disruptions to theoretical supply chains. The STS research paper uses an ethical approach to evaluate the implementation of drone warfare by Russian Ground Forces in the War in Ukraine. Both papers seek to develop academic research around these independently developing technologies to begin to generate conversation on how both can be implemented wisely and ethically.

The technical report uses systems engineering to perform a requirements analysis for synthetic aviation fuel, or biofuel, supply chains for Dulles International Airport, the largest airport in Virginia. The analysis begins with a comprehensive stakeholder analysis, quantifying and comparing engagement, financing, and time horizons for different relevant stakeholder groups. The paper includes a supply chain analysis to compare the feasibility of using different feedstocks and processor locations to supply biofuel to Dulles International Airport. Finally, the paper includes disruption testing of theoretical synthetic aviation fuel supply chains. These three function to prepare for development, negotiation, and resilience of a local biofuel supply chain. This research can serve as a template for future research and requirements analysis of other domestic biofuel supply chains.

The STS research paper examines the ethics of the method Russian Ground Forces are using one-way unmanned aerial vehicles to target military infrastructure in urban areas in the War in Ukraine. The paper argues the use of these drones violates duty ethics as it violates the

equality postulate and self-evident norms of warfare. These violations make the actions of Russian Ground Forces using one-way drones for this purpose an immoral act. This paper seeks to explore a use of drones in war that is new with this conflict and begin to evaluate its strategic and circumstantial ethical merit, providing a basis for future strategic technological implementation.

Working on these two projects brought to light the importance of conducting research and performing resilience testing on new technologies before implementing them. Performing a resilience analysis for biofuel supply chains for Virginia allowed me to see the importance of determining the right approach before implementing a new technology into a system through quantitative analysis and assessing the impact decisions will have on stakeholders. Drone usage in the War in Ukraine tells a cautionary tale of what limited research and rushing a new technology into a strategic system based on the harm caused to civilians since its first use. In summary, the technical project and STS research paper have allowed me to examine how new technologies can disrupt pre-existing systems and contribute to frameworks governing the implementation of both biofuels and unmanned aerial vehicles in the future.