

Thesis Project Portfolio

AIAA 2022-2023 Undergraduate Hybrid-Electric Regional Turboprop Design Proposal

(Technical Report)

Aerospace Technologies: How Drone Technologies and Society Play a Role in Shaping the Future

(STS Research Paper)

An Undergraduate Thesis

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Executive Summary

The technical project and STS research paper demonstrate the positive advancements of technology both today and in the future. The technical project looks to answer society's calls for more sustainable aviation in the future. The STS research seeks to demonstrate the shared influence by drones and society on each other, and how this shapes the future evolution of society and technology. The initial selection for choosing drones as a main technology to analyze, comes as the result of the sustainability this technology has and its role in carrying out various tasks that manufacturers desire. The two projects do show that requests from society are answered in the development of new aerospace technologies, and the resulting work makes a difference in society. As a result of these newer aerospace technologies, society begins to adopt these new methods and implement these technologies into future everyday life.

The future of fully electric and hybridized aircraft are continuing to grow as more calls for sustainable aviation increase. The technical project looks to answer the calls from the AIAA to undergraduate design teams to conceptually create a hybrid-electric regional turboprop aircraft. The aircraft that will be created for the 2023 AIAA undergraduate aircraft design competition implements a hybrid-electric propulsion architecture and various other systems in hopes of carrying 50 passengers, with an entry into service date of 2035. As the design process takes place, work done on creating the aircraft at hand will meet and exceed requirements set forth by the AIAA in its given guidelines described in the 2023 hybrid-electric regional turboprop RFP. The aircraft is continuously refined throughout many different design phases as a result of a variety of different analysis methods. Some of the analysis methods used include cost modeling, geometric modeling, and finite element analysis. While the design process is underway and the final aircraft design is completed, the entire process is documented and written

about in a final technical report that is delivered to the AIAA for judging. Ultimately the work conducted will lead to a final conceptual design that successfully implements a hybrid-electric propulsion architecture, meets design criteria set forth by the AIAA, sets an example for future hybrid-electric aircraft, and provides more sustainable air transportation.

Drone technologies are continuing to expand exponentially, leading to a wide-scale adoption and adaptation of these technologies in many areas of society. The STS research paper looks to analyze the interplay between advancing drone technologies and society. It is important to understand how these two areas interact with one another in promoting and shaping the future, specifically looking at the uses of drones, public policy and public perception. The STS research paper seeks to answer the following question: How does the sociotechnical nature of drone technology shape society, and vice versa? To answer the research question, the framework of technological momentum is used to convey the connections between drones and society. In addition to using technological momentum, the research methodology of discourse analysis is used to gather a variety of different electronic sources to answer the research question. As a result of the analysis conducted, the findings are applicable to the fields of STS and aerospace engineering. The results help inform both drone producers and the public of the significant role each group has in the development and uses of drones, helping to modify future drone developments that benefit each party. Additionally, the fields of STS and aerospace engineering will be able to understand the significant influence the rapid development of drone technologies has on the future methods society lives and acts by as time goes on. With this knowledge, the best and most advanced drone technologies can be developed side by side with society in hopes of shaping the future.

After conducting both the technical and STS projects, a few thoughts come to light. A main idea that becomes apparent is the strong connection both technology and society have with each other. Both technology and society work together to influence the development of each other. Sustainable, hybridized aircraft and drones play a role in the ever-expanding aerospace sector that looks to advance society, while minimizing its environmental impact as a whole. The technical project demonstrates the ability of engineers to take society's calls and implement these ideas into new technologies in a short time frame. On the other hand, the STS research denotes the rapid momentum gain in the development of drone technologies, and the resulting influences established over time. From this difference in timelines analyzed, one can see that regardless of the time period given for a technology, the presence of societal influence will remain. Despite the difference in the subject matter mentioned, the two projects work together to ultimately signify the importance of the inclusion of society's views and the acceptance of technology's influence in everyday life both now and in the future.