

**Thesis Project Portfolio**

**Conceptual Design of a Regional Hybrid-Electric Turboprop Airliner**

(Technical Report)

**The Relationship of Aviation to Global Climate Change: The Development of the Aviation Industry's Mitigation Measures and their Practicality**

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

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Bachelor of Science, School of Engineering

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## **Sociotechnical Synthesis**

The project of the conceptual design of a hybrid-electric regional turboprop airliner seeks to address the fundamental issue of aviation emissions effect on climate change. Specifically, the aviation industry, through its extensive use of hydrocarbon fuel, is responsible for a large amount of CO<sub>2</sub> and NO<sub>x</sub> greenhouse gas emissions that negatively affect the environment. This is done through the creation of the design of a new generation of regional airliner through a conceptual design challenger that has reduced emissions using a hybrid-electric powertrain. However, it is important to consider the human aspect of this design (who is going to use it? And how it may it be used?), because if the human factors relating to the design are not sufficiently addressed, then the design will not be able to be implemented in the real world, negating any potential benefits the design brings on paper.

Therefore, it is crucial to perform an STS analysis on technologies like the one being studied in the conceptual design to see if they properly address the need of the human groups they are to serve, to see if they are truly practical in their current form. This can be done through the Social Construction of Technology socio-technical framework, where the relationship between the human social groups and new climate change mitigation can be modeled. The data required to create these models can be gathered through a literature review of existing material. Through this research, it is expected that which climate change mitigation measures can be most practically implemented in the short term will be able to be determined, along with what social relationship factors are currently negatively affecting the development of certain mitigation measures.

Ultimately, the conceptual design project, with the STS research project will be able to provide an in-depth exploration of the possibilities of climate change mitigation measures in the aviation industry, with the conceptual design project providing a close technical overview of one measure (hybrid-electric powertrains), and the STS research providing a review of other measures through a socio-technical lens.