Team 16: Kite Generator

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Chapter One: EML 4551C

1.1 Project Scope

The purpose of this project is to provide affordable power for areas that do not have a reliable source of power. The idea is to harness the energy of the wind without constructing a permanent wind turbine. Conventional wind turbines need a permanent setup and require a high amount of maintenance.

Kite power allows for maneuverability and less maintenance due to less mechanical parts. Primarily, the project will catalogue and engineer an aerodynamic wing, and design a functional generator based on the available wing sizes and two or four motor autonomous drone capacities

1.1.2 Key Goals

- Design an aerodynamic kite capable of autonomous flight in oscillating sustainable patterns, while attached to a grounded tether.
- Build and test a model
- Convert oscillating kite flight path into electrical power.
- Iterate oscillating motion with different flight paths, kite designs, and wind speeds.

1.1.3 Primary Market

Underdeveloped and Developing countries

1.1.4 Secondary Market

Disaster relief
Potential to replace fixed wind turbines

1.1.5 Assumptions

Variable wind speeds and weather conditions.

1.1.6 Stakeholders

- Jeff Phipps – Senior Design Project Sponsor
- Dr. Shayne McConomy – Senior Design Instructor
- Dr. Chiang Shih – Senior Design
- Dr. Neda Yaghoobiban – Project Advisor
- Don Montague – Cofounder of Makani
- Google – Owner of Makani

1.2 Customer Needs

The knowledge required for the Customer Needs Table quickly materialized after the Senior Design Team asked the sponsor some short questions, within a very limited time period. The team targeted to start with broad questions, eventually leading into more exact questions, with expected short and definitive answers. The team probed about; what the sponsor's primary end goal for the project, the motivation behind the sponsor's involvement, and what the sponsor expected from the team throughout the year. These more abstract questions, narrowed down a significant amount of excess unnecessarily details from the project that may be better left to future project teams. The Design Team then laid out more questions designed to produce very clear concise responses. These questions included topics like; What did last semester do well, what disappointed you about their approach, and how would you like us to improve? Combined these questioned enabled the Design Team to narrow down the customer needs and focus on the project scope definition. Reduction of the abstract, qualitative initial problem statement also provides the team with an excellent direction of where to achieve quantitative benchmarks to aim for.

Customer Needs Table		
Prompt	Customer Statement	Need Statement
Suggested Improvements	Have the generator change electrical currents.	The kite generator can convert AC to DC
	Can maximize the power generated by kite.	The kite can fly in assigned patterns
Applications	Can be used for disaster relief.	The kite can be transported to various sites
	Can work in excessive wind speeds.	The kite generator operates normally in high winds.
	Can be used multiple times.	The kite generator operates normally after repeated uses
Dislike	Makani design is too bulky.	The weight of the kite system is reduced
Likes	Much less material than a wind turbine.	Better energy to weight ratio than wind turbine
	Doesn't have to be kept in one place for lifetime of kite.	The kite can be moved to various locations
	Can reach better speed winds than a wind turbine.	The kite can fly in higher altitudes reaching higher speed winds

Table 1: Customer Needs Table