Project 2 Report

Team Six

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A. Definition of Needs and Requirements

I. The Box Kite
   a. A tailless kite in the form of a long box open at each end that is designed for stability. Small wings can be attached for further stability and a greater lifting force. The main features are the two long, straight spars running the full length of the kite, the diagonal braces which make the structure rigid, and the flat cloth sails that give the kite its ‘box’ appearance.
   b. The box kite comes in several different variations: Hargrave, Traditional, Cody, Triangular, Hexagonal, and Tetrahedral.
   c. The Cody Box Kite was used in World War II by the British Navy as observation platforms. An observer could even be lifted into the air and carried off the deck of a battleship.

II. The Sled Kite
   a. The sled kite consists of a uniform piece of material that is given its shape by two spars running the length of the kite. It also can have a tail hanging off the bottom end of each spar. Air pressure keeps the sails open and holds the kite’s shape while it flies.
   b. The sled kite is mostly used for recreation and is often used for fishing from on a boat and on a shore. The sled can also be used to raise heavy equipment up into the air.

III. The Diamond Kite
   a. A diamond-shaped kite that is often found with a tail. Two rods provide structural support for the thin material. The kites have a symmetrical design.
   b. The diamond kite was used in war to simulate airplane maneuvers to enhance training for aircraft gunners. Kites were also used for defense: they were flown into the path of oncoming bombers and acted as a flying obstacle.
   c. In medieval times, the kite was also flown to a target, and then the string length was used to give an accurate measurement of how far the catapult needed to fire.

IV. The Fishing Kite
   a. A kite similar in design to the diamond kite. It creates a lot of lift and is very stable.
   b. The fishing kite is used predominantly on islands in the Pacific Ocean. It allows fishermen to reach places boats are unable to travel and allows for a farther cast.
V. Paravanes
   a. A winged object towed behind watercrafts. The paravanes have similar design qualities of air kites and they are symmetrical in one axis. They often orient themselves with respect to the water’s surface and can travel in two directions.
   b. Paravanes were developed during World War II by the British. The kites would be towed behind ships to catch on underwater mines. The kite would either cut the rope towing the mine, allowing for it to be detonated remotely, or would crash into the mine, detonating it under the water.
B. Detailed description of considered conceptual options

I. The Box Kite - by Elaina Durnack
   a. **Use for task:** Various tools and multiple instruments can be attached to the box kite to measure different conditions relating to weather and meteorology.
   b. **Suitable for task:** The kite can carry a considerable amount of weight, which is why it is perfect for carrying meteorological instruments.
   c. **Helps managing resources:** It is a relatively simple design, and as such would require minimal resource.
   d. **Technology feasible:** The kite is practical as it has been used in meteorological applications before. It provides stability and lift, two key features needed for its intended use.
   e. **Possible cost:** Since it is a relatively simple kite, the materials needed for construction and fabrication would be low.
   f. **Safety:** The impressive stability would ensure that the design is safe, and the kite would have little risk of causing damage.
II. The Sled Kite - by Shea Transue

a. **Use for task:** The sled kite would be used to carry meteorological tools into the sky.

b. **Suitable for task:** The kite would be effective at carrying tools, as its large surface area creates a lot of lift.

c. **Helps managing resources:** It uses a lot of material because of its large surface area, but will only require minimal material for the small frame.

d. **Technology feasible:** The sled is feasible because of its simple design that has been used countless times before.

e. **Possible cost:** The cost to construct the sail portion of the kite would be expensive, as it requires a lot of material, but the cost to create the frame would be low.

f. **Safety:** The kite is very safe.
III. The Diamond Kite- by Ryan Custer

a. **Use for task:** Various tools and multiple instruments can be attached to the box kite to measure different conditions relating to weather and meteorology.
b. **Suitable for task:** The diamond kite may not provide suitable lift and stability to carrying scientific instruments.
c. **Helps managing resources:** The kite is simple, two bars and a diamond-shaped cloth, and would require minimal resources.
d. **Technology feasible:** It would be feasible to construct the diamond kite, as it is arguably the simplest kite design. There may be some concerns over the carrying capacity of the kite.
e. **Possible cost:** Since it is a relatively simple kite, the materials needed for construction and fabrication would be low.
f. **Safety:** The kite is lightweight, so there are no safety concerns regarding the kite.
IV. The Winged Box Kite - by Brendan Hocker
   a. **Use for task:** The winged box kite would be used to carry meteorological tools into the sky.
   b. **Suitable for task:** The kite could carry the considerable weight of the instruments, and the wings would provide additional stability to the kite.
   c. **Helps managing resources:** The kite includes the additional material needed for wings, so it will require more resources than the simple box kite.
   d. **Technology feasible:** The kite is practical as it has been used in meteorological applications before. It provides stability and lift, two key features needed for its intended use.
   e. **Possible cost:** The kite would most likely be more expensive than the simple box kite, due to the extra material needed to construct the wings.
   f. **Safety:** The wings create additional stability, making it very safe.
V. The Power Kite - by Aaron Veness
   a. **Use for task:** Various tools and multiple instruments can be attached to the box kite to measure different conditions relating to weather and meteorology.
   b. **Suitable for task:** The power kite would generate a significant amount of lift, allowing it to easily carry instruments into the air.
   c. **Helps managing resources:** The sled kite is quite large, and would require a large amount of resources to build.
   d. **Technology feasible:** Such a complex design would be very difficult to construct.
   e. **Possible cost:** The amount of resources needed to build the power kite would incur a large cost.
   f. **Safety:** The power kite is stable and would be quite safe.
C. Concept Options/Analysis and Combination

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<th>Diamond Kite Rating (Weighted)</th>
<th>Winged Box Kite Rating (Weighted)</th>
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D. Detailed Description of the selected final Concept Proposal

We chose the winged box kite because it was most suitable in performing the task that we chose.
The box kite is a tailless kite in the form of a long box open at each end. Some are designed to fly stable, while others are specifically designed to tumble. The main features are the two long, straight spars running the full length of the kite, the diagonal braces which make the whole structure rigid, and the flat cloth sails that give it the “box” appearance. The box kite has tremendous lift and can travel at high altitudes. It is also one of the most stable kites. The winged box kite is a traditional box kite with wings attached diagonally, and makes the kite more stable and gives it even more lifting power than the traditional box.

The task we chose was meteorology, and testing conditions of the atmosphere. The kite we chose would have to be able to carry various instruments and tools that could measure different variables, such as wind speed, temperature, and atmospheric pressure. Some examples of these tools would be a thermometer, barometer, anemometer, hygrometer, radar, and even GPS signaling.
The winged box kite would be ideal for this task because it has the most lift and stability out of all other proposed kites. It can carry a considerable amount of weight, which is why it is perfect for the task. Various tools and multiple instruments can be attached to it to measure different variables relating to weather. The wings give it even more lift and carrying power as well. It is a relatively simple design as well, and requires minimal resources. This would help manage the resources available for constructing the kite. This kite is practical and is used for these purposes all the time. It yields impressive lift and stability as well. Stability and lift being critical for this task, this kite was ideal for the objective. Because it is a relatively simple kite, the cost for construction and fabrication of this kite would be low, again making it the ideal option. Since it does have impressive stability, safety would not be a concern when using this kite, which is why we chose the winged box kite.
To construct the kite, we used wooden rods, sheets of thin plastic, duct tape, and hot glue. We first cut four rods down to 40 inches and eight rods down to 14.4 inches for the frame. We then cut eight 20 inch rods for the cross sections. For the cross sections, we also cut notches so that they would fit together exactly, and would easily bind together with hot glue. We also filleted the edges of the frame so that they would fit together as well, and glued the frame and cross sections together. We then reinforced everything with duct tape at every intersection and joining of material. After constructing the frame, we cut sheets of plastic 10 inches wide to make the sails, wrapped them around the frame, and secured them with duct tape. We attached another rod that paralleled a piece from the cross section through the middle. We then attached a plastic sheet that formed a triangle from the top to the bottom, coming to a point at the middle rod, and secured it with duct tape. Finally we attached the string which enabled us to fly the kite.
We first tested the kite without the wings. The wind speeds were low. The kite did not fly, as the sails alone were not long enough to carry the kite. We first tried starting with the kite on the ground, which was a failed attempt. We then tested it starting in the air, which required two people. Both attempts were not successful. Without being able to carry itself, the kite was in no condition to carry any tools or instruments. After the first tests, we then attached the wings. With higher wind speeds, and starting in the air, the kite was able to fly successfully. It appeared very stable during flight and was able to fly at extremely high altitudes. After a successful test, we then added a 200 gram weight to simulate an instrument or tool used in meteorology. As predicted, the kite was able to lift the small weight with it and was still very stable and was able to travel very at high elevation.

The winged box kite was ideal for the task because it yielded tremendous lift and stability. The materials were of low quantity and cost, and the design was relatively simple to construct. The wings allowed it travel at the heights it successfully flew at. It was able to carry not only its own weight, but the weight of a small object as well. For these reasons, the winged box kite proved to be a successful option and met all of our expectations and requirements for this task.
Works Cited


