

# Operation Manual

**Team No. 20**

## **Development of Consumer Grade Levitating Hoverboard**



### **Members:**

Bradshaw, Evelyn (emb12k)

Drawdy, Shawn (smd12b)

Levy, Jonathan (jel13g)

Ross, Brian (brr12)

Sison, Kevin (kjs12c)

### **Faculty Advisor/s**

Dr. Chiang Shih

### **Sponsor/s**

Dr. Michael Devine

### **Instructor/s**

Dr. Chiang Shih

Dr. Nikhil Gupta

Date Submitted

April 07, 2017

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# 1. Functional Analysis

Horizon Hoverboards chose the dimensions of the hover board base to choose the air blower required to create lift and increase the stability of the board as it moves forward. The closer the length to width ratio is to 2:1 the more stable the craft will be when moving forward. It was concluded that the length and width of the hover board were to be 4 ft. by 2 ft., respectively. These dimensions were based on a ratio of 2:1 as previously stated. The depth of the hovercraft, also known as the hull, was determined to be approximately 1 inch. The hovercraft will also incorporate a skirt which will be attached underneath. The skirt is a durable, tear resistant material, which provides an air cushion for the hover craft. The skirt will need to hold a certain air pressure without rupturing. The air gap, which is the displacement between the skirt and the ground, will be 0.2 inches. This should allow a near frictionless passage over most smooth terrains.

The air blower that is used to create a successful lift under these conditions is a single 530 CFM battery-operated air blower. These blowers are designed to be light weight, rechargeable, very efficient, and could be picked up at any local hardware store.

When it comes to the materials selection of a design, specifically a levitating hoverboard, two important factors come into play stiffness and strength. Between these two characteristics, stiffness is the more important of the two since the platform in which customers will stand on, should not deflect, and if so, very minimally. This deflection may cause issues with the air flow or excessive friction between the skirt and ground. Multiple characteristics pertaining to the design effect the decision based off stiffness. In the automotive industry, minimizing the mass is the goal. It reduces cost, and it improves gas mileage, which in today's world, everyone desires.

The material selection process in our levitating hoverboard will be conducted very similar to companies in the automotive industry, which is to minimize the mass of a stiff and strong object. The analysis will be conducted only for the board, which will be treated as a rectangular plate; therefore, our goal is to select a material by minimizing the mass of a stiff and strong rectangular plate. Once the equations are completed, a material index emerges from the final equation, which for this design yielded a sandwich structure of carbon fiber and balsa wood. Also, the material selection for the skirt was vinyl coated skirt fabric (PVC).

# 1.1 Functional Diagram

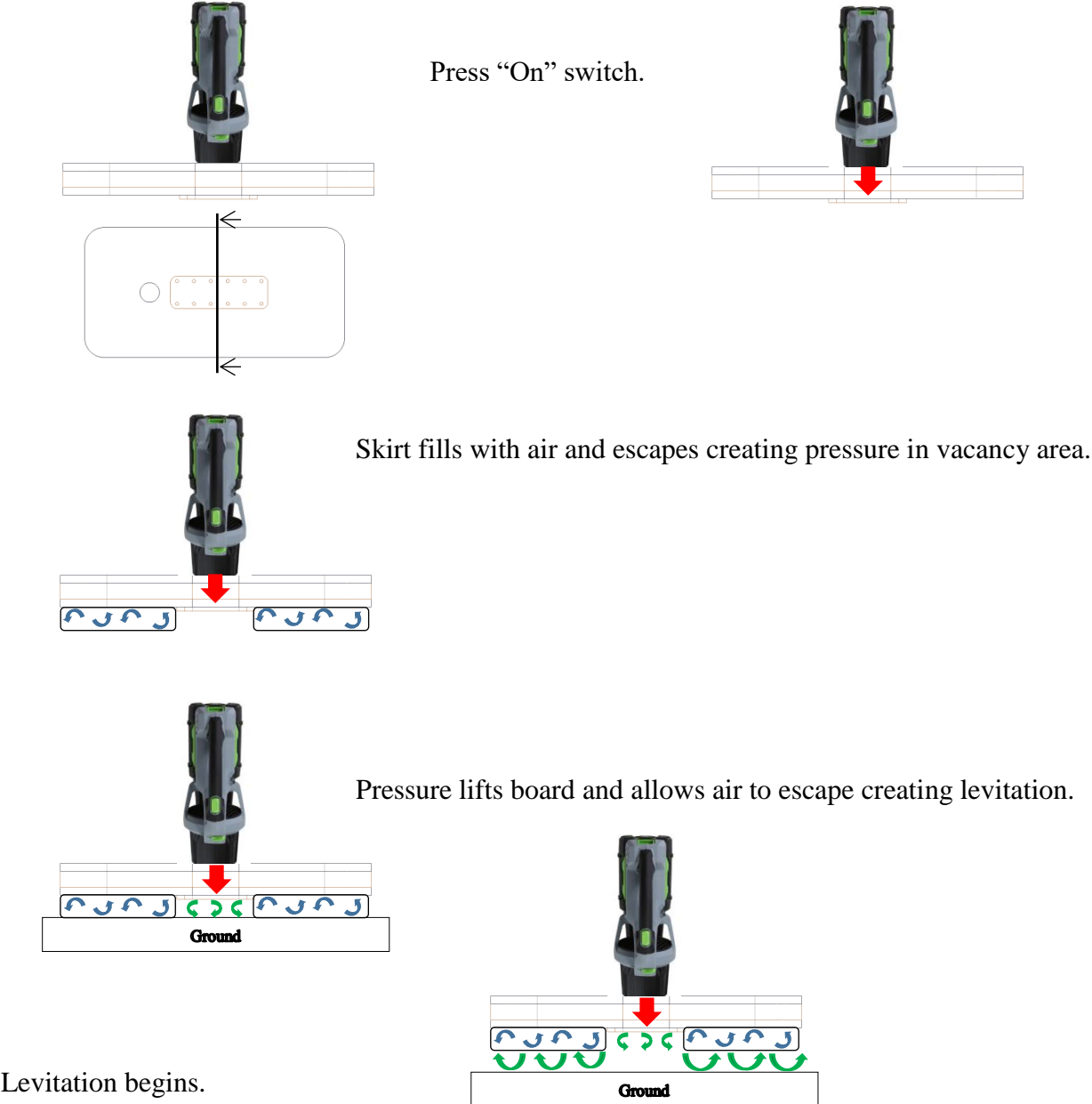
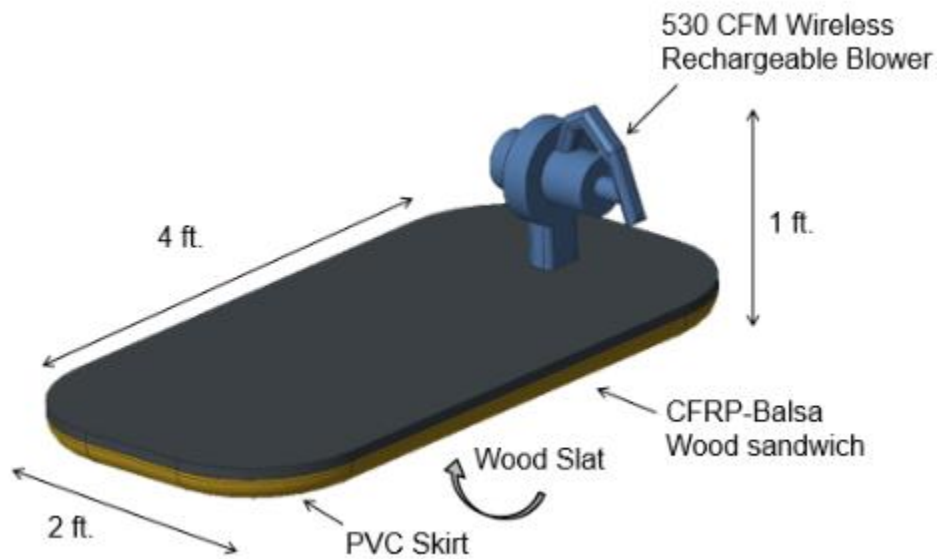


Figure 1 – Functional Diagram

## 2. Product Specification

The LULU Hoverboard is a 4 ft. by 2 ft. board made up of carbon fiber, balsa wood, and another layer of carbon fiber. The skirt is made of a PVC vinyl cloth that is completely sealed and attached to the board. The blower that provides the airflow for levitation is a 530 CFM battery powered leaf blower made by Ego. Below is a CAD model to represent the design.



**Figure 2 – LULU Hoverboard**

### 3. Product Assembly

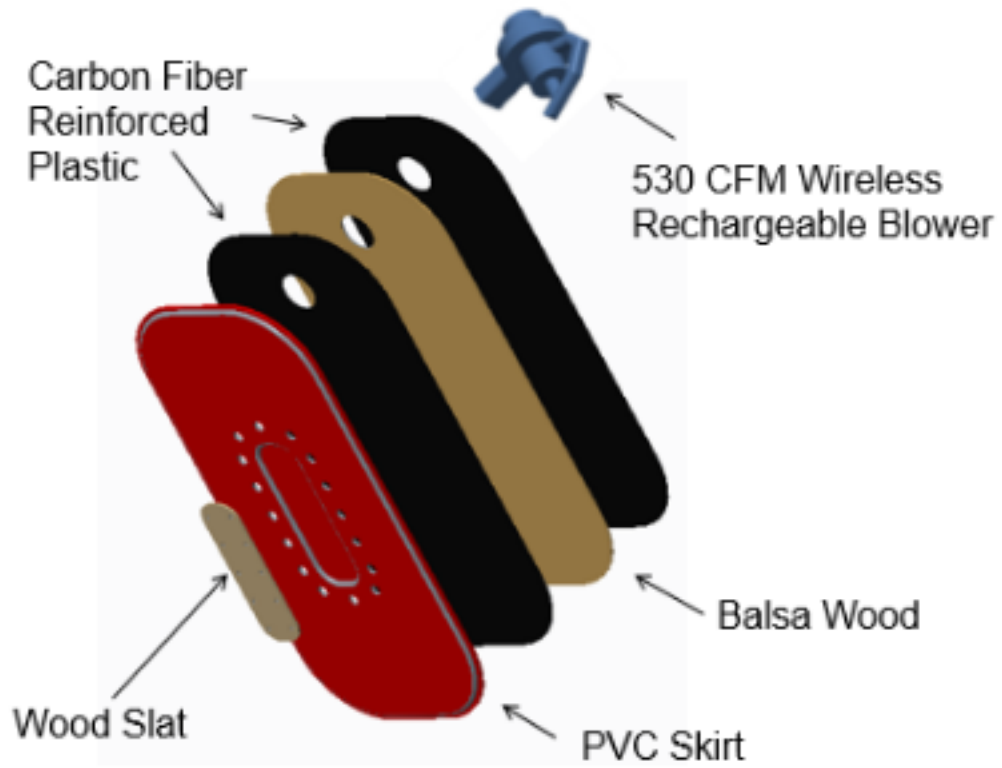


Figure 3 – Assembly View

## 4. Operation Instructions

1. Verify battery is charged.
2. Press green “On” button to power the blower.
3. Stand on center of board.
4. Wait for skirt to fill with air and expel the air to cause levitation.
4. Use either left or right foot to push off the ground for a forward momentum.

Safety is highly encouraged from Horizon Hoverboards therefore we advise the user to wear knee-pads, elbow-pads, and a helmet.



## 5. Troubleshooting

There should be no need for troubleshooting this device. Verify that the battery is charged, and if it still does not work, please return it to Horizon Hoverboards (at no cost) and we will fix any issues in a timely manner.

## 6. Maintenance

Maintenance should not be done by the user. Horizon Hoverboards will handle all maintenance requests at our nearest service center. If any maintenance is necessary for the company, it would consist of replacement screws, re-sealing, or mounting components for the blower.

## 7. Spare Parts

LULU Hoverboard will be purchased as is, with no extra components. Similar to Section 6, Maintenance, Horizon Hoverboards service centers will provide any re-work necessary. If the user attempts to fix an issue his or herself, they will be responsible for full payment of the extra components needed.