**DESIGN**

**Bottle: Shape vs Durability**

The width of the bottle available is not aerodynamically ideal but the material is strong enough to withstand the pressure. It is filled with 25% - 30% of water.

**Fins: Drag vs Center of pressure**

The fins have a simple trapezoidal shape. The span is 1.5 times the length of the bottle’s diameter, making the fins proportionate to the rocket body without increasing too much the drag.

**Nose Cone: Curved vs Pointy**

The tip of the nose cone is rounded to make it more aerodynamic and stable since our rocket is subsonic, i.e., traveling at a speed lower than the speed of sound.

**Parachute**

The parachute is made out of a thin large plastic bag in order to provide more air resistance. For simplicity, the shape of the parachute is octagonal.

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**INNOVATION**

**Fin support**

Since the curved shape of the neck of the bottle makes it harder to attach the fins, a support is created to place them vertically.

**Separation Flaps**

Flaps provide bigger surface area to take advantage of the upward force created by the air when the rocket starts falling down. In addition, the flaps will serve as a lever to push the nose cone away from the main body.

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**SUSTAINABILITY**

**Utilization of waste materials**

The body of the rocket and the nose cone are made of used plastic bottles. Furthermore, cardboard material is reused in the construction of the fins.

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**SAFETY**

**Strings**

The nose cone, the parachute and the main body need to be attached to each other with strings to avoid missing pieces, thereby possibly harming others. Furthermore, we performed several tests to assure that the launch of the rocket is safe and secure.

**Center of pressure**

The center of pressure must be closer to the nozzle than the center of mass. To move the center of mass closer to tip, a right amount of weight was added into the nose cone.

**No sharp edges**

For the design of the rocket, no sharp edges or pointed tip were included as safety precautions, the reason for the rounded end in the nose cone is both safety and efficiency.