**Lesson Plan (for day-of)**

*Engineering vocabulary:*

* Aerodynamics: properties of moving air and the interaction between the air and solid bodies moving through it.
* Force: a push or pull upon an object resulting from the object's interaction with another object
* Air resistance: force that air pushes against a moving object
* Gravity: force of attraction that pulls together all matter
* Terminal velocity: when gravity pulling down equals the air resistance pulling up

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| **Time** | **Length** | **Description** |
| 3:15pm | ~10-15 min | **Part 1: Introduction**  Introduction: Go over the powerpoints describing the concept of aerodynamics of parachutes and go over today’s lesson goals |
| 3:35pm | ~ 20 min | **Part 2: Troubleshoot today’s parachute challenge**  Key tasks:   * Place students in breakout rooms * Build and test the parachute   + Does your parachute fly in the air?   + Does your parachute have soft landing?   + Does the time for your parachute to land change with increasing number of paperclips   + If your parachute drops from air or doesn't land softly, why do you think so?   + What do you think can be improved using the materials you have? |
| 3:50pm-ish | 15 min | **Part 3: Test, iterate, record measurements**  When you are done building your parachute, drop your parachute from your eye level! How long does your parachute take for it to land on the ground? Is it a soft landing?  **Questions:** Keep in mind the factors that may affect the parachute’s ability to stay in the air. Do you need to change the size of the canopy? Do your strings need to be longer? Do you need to add more strings? Size, shape and the material of choice for the canopy may affect the parachute’s performance. Does adding more paper clips change the performance.  Engineering questions:   * What type of material makes the best parachutes? Why? * What materials did not work well? Why? * Is there a correlation between the number of clips (independent variable) and time taken for parachutes to land? (dependent variable)   Give students additional 10 minutes to incorporate changes.  Additional activities students can try out:   * Using the paper material that worked the best, do the same activity testing the parachute size. Have students test circles with different radii to find the optimal size. * Try parachutes with and without holes in the top, and different-sized holes. |
| 4:05pm-ish | 5 min | Bring everyone together, have students share designs / strategies |
| 4:10pm | 5 min | Final questions, closing thoughts |

**Make your parachute!**

(lesson adapted from https://www.teachengineering.org/activities/view/design\_a\_parachute)

The goal of this lesson is for students to understand the concept of gravity and air resistance and build a parachute that can stay in the air the longest. Students will test out different designs and materials to understand what is needed for the parachutes to stay in the air longer.

**Materials:**

* Foils, paper towels, fabric or magazine papers (Material for the canopy)
* Tape
* Strings
* Scissors
* Paper clips (weight for the parachute)