

Touchdown Design Challenge

By: Amy Donohue

In this engineering design challenge, the students will design and build a shock-absorbing system that will protect two "astronauts" when they land on Mars. Adopted from JPL's education website, students will follow the engineering design process to design and build a shock-absorbing system out of paper, straws, and mini-marshmallows. They will attach their shock absorber to a cardboard platform and improve their design based on testing results. This challenge mimics how engineers had to develop solutions for landing different vehicle types on the moon and Mars. Timeline: 2-3 hours

<https://www.jpl.nasa.gov/edu/teach/activity/touchdown/>

Student Samples

Identify the Problem

Identify the Problem:
 To design and build a shock absorbing system that will protect astronauts when they land.

Criteria:
 1. The astronaut must stay in the lander.
 2. The lander can't tip over.
 3. The cup has to stay open.
 4. The astronaut can't be tipped over.

Constraints:
 1. Limited materials.
 2. Time.

Signature: Ortal Date: 7/10/20
 Designed and Developed by: Ortal Date: 7/10/20 Proprietary Information

Design

Design: Be sure to label and identify all parts of your design.

Signature: Ortal Date: 7/10/20
 Designed and Developed by: Ortal Date: 7-6-20 Proprietary Information

Brainstorm

Brainstorming: Think about how to build a spacecraft that can absorb the shock of a landing.

What kind of shock absorber can you make from the given materials that can soften a landing?

- the bag
- cup
- marbles
- cereal
- straw

How will you make sure the lander doesn't tip over or fall through the air?
 - tape the cup the middle

Signature: Matthew Pepe Date: 7/10/20
 Designed and Developed by: Pepe Date: 7/10/20 Proprietary Information

Share

Build



Redesign

Redesign:

- Based on the results of your tests make improvements to your design.
- What changes are you going to make?
 better protect 20 mar
 add straws on each side of base

- Why are you making these changes?
 because it will help absorb the shock

Signature: Joseph Ortal Date: 7/10/20
 Designed and Developed by: Ortal Date: 7/10/20 Proprietary Information



Test and evaluate:

Tests:
 - Decide on a test for the model and try it out:
 We will drop from 6 feet

- Record your results:
 No everything was bad
 the first one and as it rains fell off

Evaluate:
 - List the strengths of your design:
 The bag

- List the weakness of your design:
 Straws

Did your design solve the problem?
 No

Signature: Andrew C Date: Joe
 Designed and Developed by: Joe Date: 7/10/20 Proprietary Information

Test and Evaluate

Big Take Aways...

In this engineering design challenge, there were several parts that I thought went well. I felt that the students had good discussions while brainstorming ideas for the lander. They talked to each other about what materials would be the best for cushioning the lander. They also brought up ideas about how to slow the lander down by building a parachute. I also liked how during the design phase, each student had different ideas and all of their designs were unique.

Some parts of the design challenge did not go as well as I had hoped. First of all, I did this activity with my son and his friends who are all entering 5th grade this fall. This was difficult because 5th grade boys who are all friends could be rather silly. Also, because of social distancing I had the students work mostly as individuals. I didn't want to create groups or partners where I would have definitely have done that in the classroom. I found it challenging to get the boys to write down everything in their engineering notebook. They didn't want to elaborate or include a lot of detail. They also became a bit competitive and didn't want others copying their ideas.