

TIME ALOFT Engineering Design Challenge

Project Connect
Asheville School
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The following challenge was reviewed and approved by:

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<http://www.ncat.edu/academics/sot/gcs/index.html>

Design Problem	NASA plans to send a small lunar explorer to the surface of the moon. This lunar explorer looks a lot like a common tennis ball. NASA already has a rocket that will launch the tennis ball, however, they need help with the descent phase of the mission. NASA needs a creative solution to make the lunar explorer land slowly on the surface of the moon. The team (company) that can achieve the slowest descent rate wins the contract. NASA will determine the winner by measuring the amount of time the lunar explorer (tennis ball) is in the air.
Specifications	<ol style="list-style-type: none">1. Only the rocket may be used to launch the tennis ball.2. The rocket must be launched using the provided rocket launcher.3. The rocket will be pressurized to a maximum of 50 PSI.4. Timer starts on liftoff and timer ends when the ball returns to earth. NOTE: Should the ball land in a tree (or bush, etc.) the timer will stop. If the ball lands on a man made structure the timer will stop.5. The launch location will be designated by NASA.6. Only the supplied equipment may be used for the design.7. If your team needs more supplies you <i>may</i> be allowed to purchase the needed supplies using time as money (time will be removed from your "time aloft" score).
Materials	<ul style="list-style-type: none">● 1 rocket (2 litre plastic soda bottle)● 1 plastic wide mouth cup● duct tape (4 ft)● string (20 ft)● 1 plastic bag● scissors

	<ul style="list-style-type: none">● 4 straws● 4 sheets of 8.5x11 paper● 1 coat hanger● cardboard● 4 rubber bands● pliers
Deliverables	<ol style="list-style-type: none">1. Students will work in teams of 4 and develop a solution to the “Time Aloft” challenge.2. The process used to develop the solution should be recorded using the student’s engineering journal. The journal should include sketches of the solution.3. Students will present their solutions.
Earn Bonus Points	Earn 15 bonus points (15 seconds added to your time aloft) by building your own HYPSONETER and measuring the maximum height your tennis ball reaches during launch. Someone on your team must also be able to explain how the HYPSONETER works to the rest of the class in order to earn the points (the explanation must be correct).

DEMO

A NASA engineer will provide a demonstration of how the rocket is safely pressurized and launched.

SAFETY

All participants must use common sense to stay safe. We are using sharp tools and pressurized rockets that pose a danger. If you need help or guidance to make sure you’re staying safe please contact a workshop facilitator.

PERFORMANCE RUBRIC

The following rubric will be used to evaluate your team:

Identifying the problem(s) and brainstorming solutions	Showed a clear understanding of the problem(s) to solve. Independently brainstormed solutions. <i>3 points</i>	Needed some teacher direction to define the problem(s) and brainstorm possible solutions. <i>2 points</i>	Needed lots of teacher direction to define the problem(s). Little if any independent brainstorming. <i>1 point</i>	Points:
Working as a team member	Worked well together. All team members participated and stayed on task. <i>3 points</i>	Some team members were occasionally off task. <i>2 points</i>	Most team members were often off task and not cooperating or participating fully. <i>1 point</i>	Points:
Using the design process	Team brainstormed many design ideas and tested and improved the design. Final design complete or nearly complete and shows creative problem solving. <i>3 points</i>	Some team members were occasionally off task. <i>2 points</i>	Team brainstormed few design ideas and did little testing or redesigning. Final design lacks clear design idea(s). <i>1 point</i>	Points:
Processing the science and engineering	Team gave a strong presentation of its solution to the challenge and showed clear understanding of the science concepts and design process. <i>3 points</i>	Team gave a basic presentation of its solution to the challenge and showed basic understanding of the science concepts and design process. <i>2 points</i>	Team gave a weak presentation of its solution to the challenge and showed little understanding of the science concepts and design process. <i>1 point</i>	Points:

POINT TOTAL: _____

Engineering Design Process Folio – Time Aloft

Team Members (list)	
Date Started	
Due Date	

1. Define the Problem

What need or want must be met by the solution?

2. Brainstorming

In the space provided below, sketch three possible solutions to the given problem. Remember to be creative!
Use the back of this paper if needed.

3. Research and Generating Ideas

In the space below, document your research. Be sure to include proper citations at the end of your notes.

NOTES:

Citations / References:

4. Identifying criteria and specifying constraints

What are the criteria and constraints?

Criteria	Constraints

Materials List

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5. Exploring possibilities

Reflect on your brainstorm ideas and research notes. Generate any additional designs which you feel meet the criteria and constraints in the space below.

6. Developing a Design Proposal

As a team, review your sketches / drawings and determine the best idea. Sketch your best idea below.

7. Build Your Solution / Prototype

8. Testing and Evaluating the Design

As you create your solution, you will perform tests to make sure the solution is meeting the needs of the given problem. If your solution does not work, you may need to repeat the previous steps of the Engineering Design Process, until you find a functional design. In the space below, document the type of test you conducted and the results.

9. Refining the Design

Based on your tests, propose refinements to the design and construction of the design problem in the space below.

10. Creating or Making It

If time allows, modify your model/prototype as proposed in refining the design (above).

11. Communicating processes and results

Prepare a presentation depicting your design process and your final solution. Your presentation will be delivered to the entire class. Your presentation must include all members of your team in some way. Creativity during the presentation is a plus.