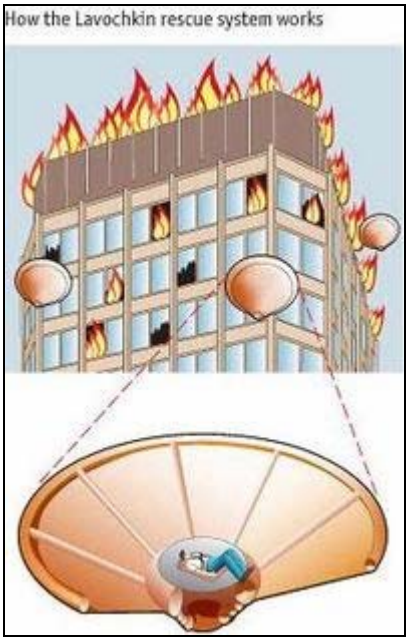
Activity Title: The Rover has Landed!

Activity Objective(s): The Landing Pod, with the Lunar Transporter Rover inside, is to land and deliver the payload safely when dropped from a significant height.

Grade Levels: K - 2

Lesson Duration: One 60-90 min session

Process Skills: predicting, observing, measuring, evaluating



The Lavochkin Association, a Russian aerospace firm, invented the **Lavochkin Rescue System** for escaping from burning buildings.

Materials and Tools (per group of three students):

- General building supplies and tools
- Bubble wrap

Club Worksheets: (Make copies for each student to put in binder)

1. The Rover Has Landed! Data Table and Discussion Questions
2. Summary
3. Fun With Engineering at Home

Club Facilitator or Teacher Notes by Stage:

(Based on those running 60-minute Clubs)

Stage 1: Set the Stage, Ask, Imagine, Plan (Approx 20 minutes)

- Remind the students of the **Design Story** (in the Unit 2 Overview) and today's **Challenge: Today the Landing Pods, with the Lunar Transporter Rovers inside, will be dropped from _____ m.** (Tell them from how high the Landing Pods will be dropped and then show them this height for a visual connection.)
- Assemble students in a whole-group format and have a discussion using the questions below as a guide. Take answers from members of each group, and ask the students to compare their experiences to other group experiences. Allow students to view all group designs and discuss similarities and differences.

1. What were some of the most important parts of the Lunar Rover to keep safe and how did you keep them safe?
2. What would you add to your designs if there were no building rules or limits?

Stage 2: The Landing (Approx 5 minutes per team)

- Hand out the ***Landing Data Table*** (1 worksheet per team).
- Gather the teams together – everyone should observe all of the landing events.
- One at a time, drop the Landing Pods.
- Open each Landing Pod after it comes to rest. Place ramp up against the Landing Pod and let the Lunar Transporter Rover roll out. (It might require a little push.)
- The students should:
    1. Measure the distance the rover rolls.
    2. Check to see if the egg stayed closed.

Stage 3: Improve (Approx 15 minutes)

- After all of the Landing Pods have "landed," engage the students in a discussion guided by the following questions

1. What do you worry most about when your Landing Pod hits the surface?

2. What is similar about all the designs built? What is different?

- Students return to their tables and answer the discussion ***Post-Landing Questions*** on the worksheet as a team.

Stage 4: Landing Challenge Closure

- Hand out the ***Summary Sheets*** (please collect one per team and save in a folder for NASA).

Stage 5: Previewing Next Week (Approx 10 minutes)

- Up until now, we have been thinking about how to get to the Moon. Starting next week, we will be thinking about what it takes to live on the Moon. If time permits, show the media clip *Return to the Moon: The Journey Begins*. (http://www.nasa.gov/mission_pages/exploration/multimedia/index.html) *Return to the Moon: The Journey Begins* is found at the bottom of the page.

- Discuss some of the things they see in the video such as equipment, tanks, housing structures, and solar panels. Encourage students to think of ways these items could play a part in living on the Moon.

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The Rover has Landed!

Landing Data Table

Trial	Drop Height (m)	Number of Pieces of Bubble Wrap Used	Distance Rolled (cm)
1			

Post Landing Questions

Did your Landing Pod remain closed during impact? **Y** **N**

Did the egg remain closed during impact? **Y** **N**

Did your rover roll down the ramp? **Y** **N**

How far did it roll? _____ cm

If you were to drop your design again, would you need to make design changes?

Y **N**

Draw a picture showing your Lunar Rover and Landing Pod after the drop:

2. Summary

Think about any observations you made about what happened during the experiment to land the Lunar Rovers. Think about changes you would now make to improve both the Lunar Rover and Landing Pod for future attempts.

Draw a picture of a new Lunar Rover (Label changes on your picture):

Draw a picture of a new Landing Pod (Label changes on your picture):

Team Name:_____

Fun with Engineering at Home

Activity 7: *The Rover has Landed!*

Today we simulated the landing of the Landing Pod containing the Lunar Transporter Rover. This activity models the way the Mars Exploration Rovers were landed onto the surface of Mars.

Tell your family about how your Landing Pod survived the stress of impact. What were its strong points? If you could design it again, would you do anything different?

Home Challenge: During this week, talk to your family members to see if they have any ideas on how to improve the Landing Pod. Write a one-page letter to the NASA engineers working on lunar exploration telling them of your suggestions for building a Landing Pod that will deliver its payload safely to the surface.

Bring these letters to the NASA STEM Club next week, and your teacher will turn them in to NASA. The letters will be reviewed, and the best letters will be posted on the World Wide Web. Neatness and spelling count!!

Your teacher will be given the Web address where you can see which letters get selected for posting.

Please put your name ONLY ON THE BACK of the letter, not on the front of the letter, because NASA is not allowed to post the names of children on the World Wide Web. Be sure to include the name of your school and the name of your teacher.