

### DESIGN challenge

*To design and build a Landing Pod for the model Lunar Buggy that was built in the previous session.*



#### OBJECTIVE

*To demonstrate an understanding of the Engineering Design Process while utilizing each stage to successfully complete a team challenge.*

#### PROCESS SKILLS

*Measuring, calculating, designing, evaluating*

#### MATERIALS

*Lunar Buggy with egg cargo*

*General building supplies*

*Meter stick*

*Balloons*

*Bubble wrap and/or packaging material*

*Cardboard and/or shoeboxes*

#### STUDENT PAGES

*Design Challenge*

*Ask, Imagine and Plan*

*Experiment and Record*

*Please note: This activity may require two 60-90 minute sessions to complete.*

## MOTIVATE

- Show the video titled “Entry, Decent, and Landing (EDL).”

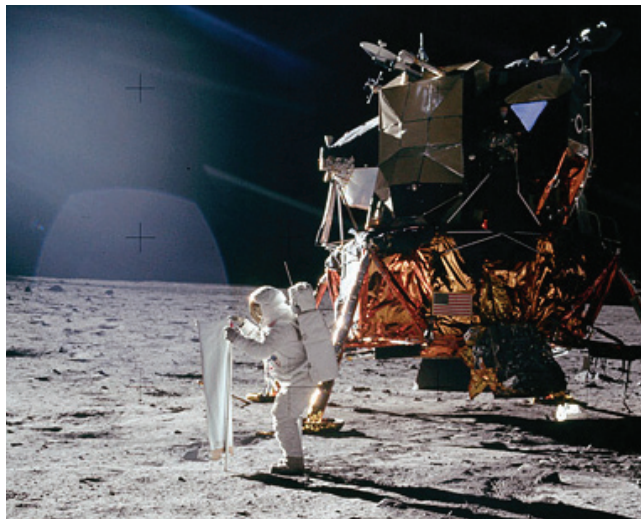
<http://marsrovers.nasa.gov/gallery/video/challenges.html>

- Ask students to pay particular attention to the ways NASA slowed the rovers down as they entered the atmosphere. Note the difference between the Martian atmosphere and that of the Moon.

## SET THE STAGE:

## ASKIMAGINE &PLAN

- Share the *Design Challenge* with the students.
- Remind students to imagine a solution and draw their ideas. All drawings should be approved before building.



## CREATE

- Challenge the teams to build their Landing Pod based on their designs. Remind them the Lunar Buggy must be secured inside the Pod but cannot be taped or glued in place. Students should also be sure that the egg inside the rover is empty.

## EXPERIMENT

- Each team must complete three trial drops and record observations.
- The actual “landing” is simulated by the facilitator. Suggestions: Drop Landing Pods safely out of a second story window, from a landing of a stairwell or from the top of a ladder. (Safety note: follow the manufacturer’s recommendation when using a ladder.) Just be sure the students know ahead of time what to expect.
- Open each Landing Pod after it comes to rest and check Buggy is upright.
- Using the same ramp as last session, place the Landing Pod at the top of the ramp and let the Lunar Buggy roll out. (It might require a little push.)
- The students should measure the distance the Buggy rolls and check to see if the egg stayed closed.



## IMPROVE

- Students improve their Landing Pods based on results of the three trial drops.

## CHALLENGE CLOSURE

Engage the students with the following questions:

- Which materials worked best to protect the Lunar Buggy?
- If you knew you ahead of time that your Buggy had to survive a landing, would you have made any changes to your design?

## PREVIEWING NEXT SESSION

Soon NASA will send the next generation of explorers to Mars or other destinations in the solar system aboard a new *Crew Exploration Vehicle* (CEV). The next session will have teams design and build a CEV that will carry two - 2 cm sized passengers safely and will fit within a certain size limitation.



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Design a  
Landing Pod  
**Teacher page**