

# INTERNATIONAL SPACE WEEK: STEMFEST

L.O. TO PLAN AND DESIGN A  
LUNAR LANDING.



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I can explain what a lunar landing is and how it was used.

I can design my lunar landing.

SUCCESS  
CRITERIA.

# LUNAR LANDINGS.

- The science explaining how to fly to the Moon was actually worked out in the 17th century but it took until the middle of the 20th century for the technology to be developed to make a lunar landing possible. Landing on the lunar surface is very difficult because of the Moon's lack of atmosphere; friction cannot be used to reduce speed and parachutes are of no use for the same reason. Very careful deceleration of the engines is required, landing gently on the rocky surface, avoiding possible destruction of the module or disturbing layers of dust that could affect instruments.

Image shows Lunar Landing Research Vehicle 1964



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# LUNAR LANDINGS.

- Watch the following video clip of a lunar landing (link: Apollo 11 lunar landing 20 July 1969): [https://youtu.be/k\\_OD2V6fMLQ](https://youtu.be/k_OD2V6fMLQ)
- Try to think about these questions, you may want to make a note of your answers:
  - What did they notice about the landing?
  - What would engineers have to think about when designing and building a lander?
  - Why could a parachute not be used to slow down the lander?
- Explain that the lander or 'module' carrying astronauts down to the Moon's surface has to land gently in an area of the Moon that is free from rocks, craters and other hazards to avoid injury to the astronauts or damage to the instruments. The moon does not have any atmosphere, so a parachute would not have any effect – can you think why?



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# YOU ARE THE AEROSPACE ENGINEER....

- First can you demonstrate how you land when jumping from a height or even from the ground. Give it a go.
- You bend your knees to absorb the shock on touching the ground. Try it again and notice how different heights (be careful and ask permission) of jump or heights you jump from adjusts the amount of depth and angle your knees bend.
- Today you are taking the role of the aerospace engineer to design and build a simple lander to protect two 'astronauts' when they land. The lander must be able to carry a 'cabin' containing the 'astronauts' and land upright when dropped without damage to the lander or loss of astronauts.
- You can design your lunar lander with measurements and descriptions to the sections and what you have used and why.
- You can design an outline and build your lunar model (you may even video dropping it from height to see if it works).
- You could build your lunar model out of Lego, to show what it may look like.



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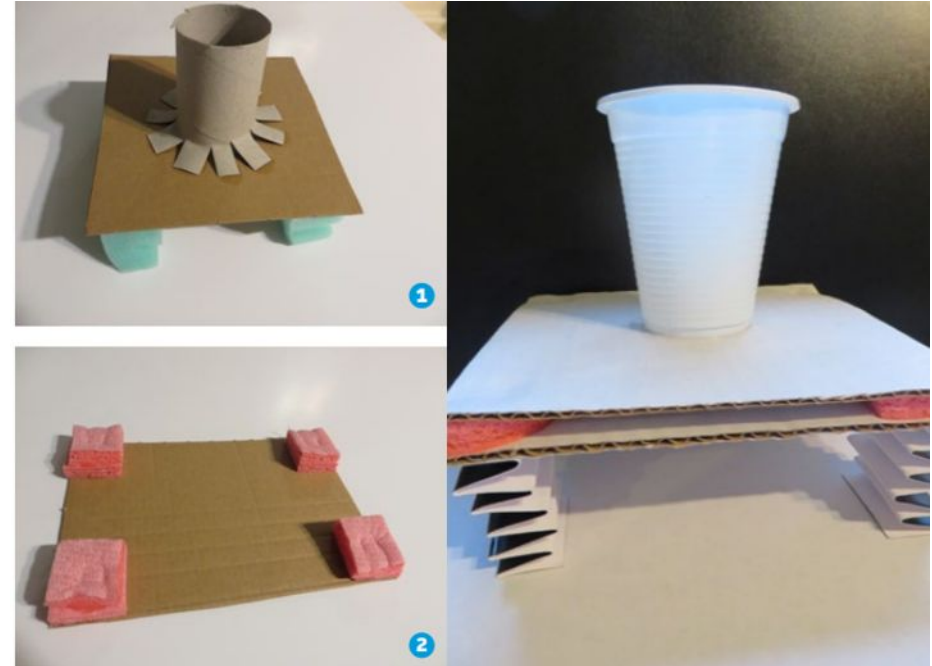
## TIME TO THINK...

- Think about a spring and can you remember how it deforms when pressed or when it is dropped onto a surface.
- A spring is how a shock absorber works, by absorbing the shock of an impact.
  - Can you think of other soft, springy materials that squash and spring back to their original shape or size after impact?
  - Can you fold a piece of paper to produce a spring? Think of the paper fans you used to make (concertina design).
  - Can they think of other materials to help astronauts land softly? I will give you an idea, what about sponges?



## WHAT YOU MAY NEED.

- A selection of suitable craft materials
  - Scissors
  - Paper
  - Straws
  - Paper cup
  - Cardboard
  - Sticky tape
  - Rubber bands
  - Bubble wrap
  - Cotton wool balls
  - Model figures (Lego) or marshmallows x 2
  - Pieces of sponge
  - Imagination
- You could use for your lander two pieces of card with a few pieces of sponge or similar shock absorbing materials between the two cards, or use one card with four legs made from sponges or springy card attached underneath; a 'cabin' glued on top will hold the 'astronauts'. Several cards, each with four landing legs made from a different material.



# EVALUATION.

- Look at your design and think of any changes you may have made from the initial plan, as you were building.
- What problems did you encounter?
- What changes did you make?
- What advice would you give to aerospace engineers designing future Moon landers?
- Why is landing on the Moon different from landing on Earth?
- How might the lunar surface affect the landings and equipment on board?
- Remember that engineers frequently encounter problems and must amend their designs to achieve success.
- Further ways to help evaluate your lunar lander:
  - Increasing the height of drop.
  - Testing springs of different sizes.
  - Varying the landing surfaces.
  - Changing the size of the lander

