

# Space Landing Adventure

How to design an emergency capsule to land safely on a planet



## Objective

To teach practical lessons to:

- solve problems under time pressure & resource-constraints
- collaborate than solving alone
  - many minds better than one
  - plenty of twigs make a strong broom
  - many brothers is like having a strong fort
- Think out-of-the-box

## Materials

- Robot astronaut – 1 egg each
- Lifeline materials packed in a plastic bag, one for each
  - 2x 24-inch strings
  - 10x plastic straws
  - 1x small plastic tape
  - 6x table napkins
  - Pair of scissors
  - 4x rubber bands
  - 1x balloon with small hole (not good for inflating)
  - 2x BBQ wooden sticks or lollipop sticks (no sharp ends)
- Additional resources
  - Dummy robot – 1 egg (for testing)
  - 6 x safety capsules - 1/3 portion of a cardboard egg dozen box (slots for 4 eggs)
  - Large plastic squares as larger parachute replacements if they decide to team up
- Prizes/rewards
  - 5 chocolate eggs each for every attempt
  - group reward: 1 large pack of egg chocolates to share - if more than half of robots survive

## Scenario

It's year 2035. You are all part of the Mars mission – to land in Mars and to start to build a living city there. Your spaceship has been travelling from Earth for 18 months and is now in the exosphere of Mars – so, almost there!

It's been smooth sailing so far, but – suddenly, EMERGENCY! The ship's central computer has unexpectedly failed, shutting down all communication contact with Earth. It must be restored immediately within the next 50 minutes. Otherwise, the ship will be sucked into the planet's gravitational field and start to accelerate towards Mars without any control. Not a very good situation for everyone on-board!

There's only one way to restore it – to send robot astronauts safely down on the surface, connect to the Mars rover and use its satellite hook-up to tell NASA in Houston to reset the ship computer

from Earth (sorry, seems that was one bad design!) Once that's done everything will be normal – and the entire space ship could land safely.

You are the brightest engineers on-board the ship. So, the Admiral asks you – with great urgency - to come up with a way for the robots to land safely on the surface. Since all the landing modules are shutdown, you're given emergency lifeline packs. Use these packs to build landing modules – no other materials must be used.

Aim is to jump off in 1 hour. By that time, your capsules must be finished and the robots securely strapped inside. Time starts now!

## Timeline

Time		Lessons
0 – 8 minutes	Each one tries to figure out the problem.  Questions expected.  Focused on own ideas and materials.  Starts to build own solution.	Encourage them to define problem, think of solutions and plan
5 minutes	Admiral announces: "One of our guys found out that we have an extra set of robots. So we'll give an extra one for each. You can use this for testing your emergency landing modules. Testing commences in 10 minutes – prepare your test landing modules and once you're prepared to test, go to Captain Kirk."	Encourage them to test ideas  Captain Kirk gets the design and drops them off from 2 <sup>nd</sup> floor.
10 minutes	Admiral announces: "We realised that we have safety capsules. These could accommodate 3 – 4 robots. These could not be cut and should be used as is. There must be a minimum of three robots to use it. Otherwise, it won't work. Who likes to use these?"	Encourage them to collaborate and combine resources together  Encourage them to share to others the solutions that work successfully
15 minutes	Admiral: "Someone is asking here – is there possibility of making a large parachute? Think about it."	Encourage creative thinking.  For those who realised they could tape together the plastic bags – be ready to replace them with a large plastic to make it easier.
30 minutes	"Last ten minutes – sorry we're now starting to be sucked in by the gravitational pull"	
40 minutes	"Time is up, time to jump!"	

40-50 minutes	Actual release from ship	
50 – 60 minutes	Review Lessons Learned	Encourage to learn from successes and, importantly, from mistakes

## Possible Solutions

### 1. Individual solutions

- Wrap-around – plastic straws, napkins, wooden sticks, plastic tape
- Add-on: Small parachute using plastic packaging
- Add-on: Rubber balloon to wrap and protect
- Add-on: Repair balloon hole and inflated for added protection.
- Add-on: Plastic bag to

### 2. Group solutions

- Safety capsule for 3-4 eggs & wrapped around with paddings
- Large parachute made from taping together the plastic bags



Year 2035, Voyage to Mars

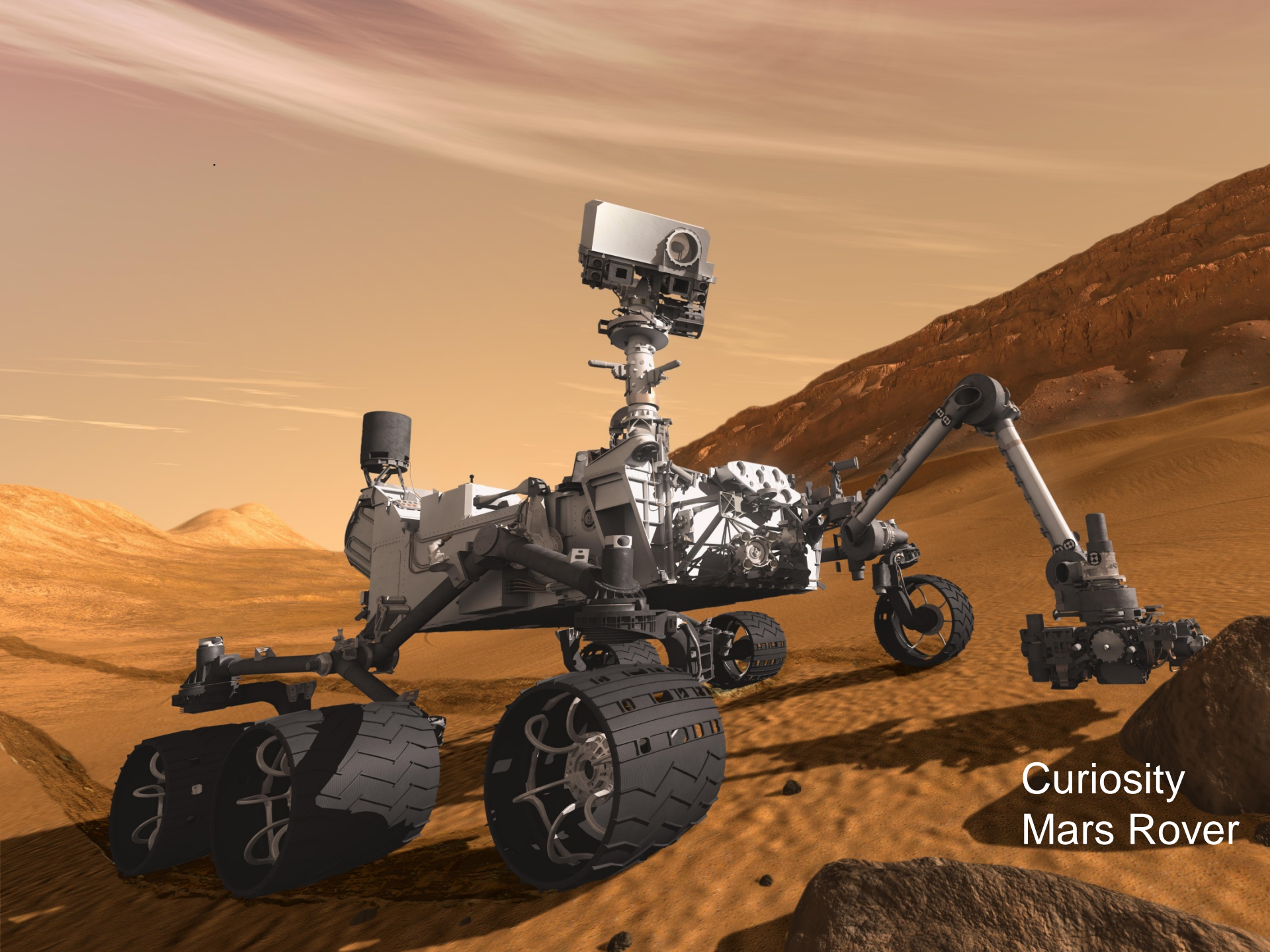


**HELP,  
EMERGENCY!**





**I HAVE A  
MISSION FOR  
YOU!**



Curiosity  
Mars Rover



**HURRY, WE  
DON'T HAVE  
MUCH TIME!**



Your mission:  
**DESIGN A LANDING CAPSULE  
SO OUR ROBOTS COULD LAND  
SAFELY**