



## STEM Project 1C - Rover Design

# *Dust: Earth & Beyond*

### *The Challenge*

To address dust issues encountered on the Moon, Mars and Earth



Write your  
name on the  
Earth

### *Ways to Meet the Challenge*

This project has many different parts to it and you will be looking at one area in particular.

**Design and build a rover to drive through dust**



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### *Find Out More and Get Thinking*

Here are some points you might like to consider in your design process:

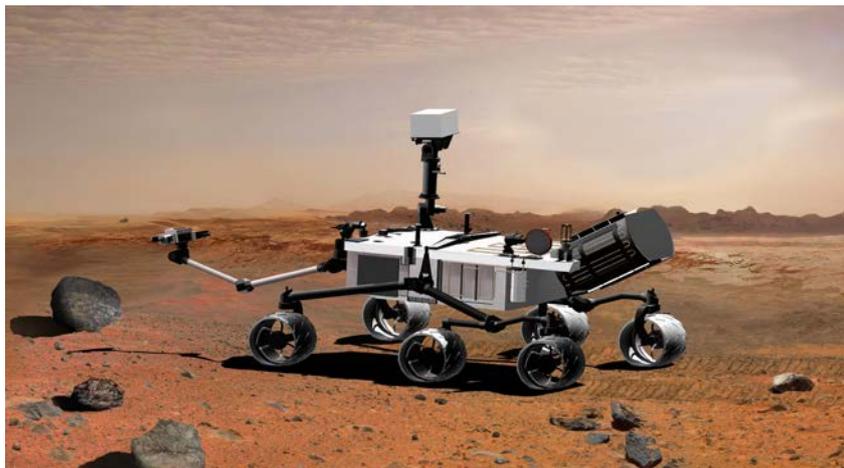
1. How can the rover be prevented from sinking into the dust or getting bogged easily?
2. Is your design suitable for use on Earth, the Moon and Mars or just one of these? Could small adjustments make it suitable for other places? Consider atmospheric conditions, temperature it can operate in and the terrain (landforms) it may need to travel across.
3. Will your design be remote control or autonomous (able to work without people operating it)? Will it be able to carry people who may operate it or be passengers?
4. If your design will carry people, will it be open or enclosed (eg. have a cab or canopy)?
5. Your design will need to be transportable, especially if it is being used on Mars or the Moon. Consider its size and weight.
6. How will your rover move? Consider:
  - Wheels (solid/inflatable)
  - Legs
  - Continuous tracks (like a tank)
  - Air or other gas (hovercraft style)
  - Skids (like skis)
7. What energy source will your design use? Consider batteries (different types), solar panels, nuclear source or others.





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8. Consider the materials your rover design will be made from. Will it be strong enough to carry heavy scientific equipment? Does it need to be flexible to more easily move over uneven terrain? Will the weight affect if it sinks in the dust? How will the materials last in a thin atmosphere such as on the Moon? It may be exposed to solar radiation more than on Earth as well as meteorites striking it.
9. What navigation tools might your rover design include?
10. Consider adding something to your design to help the rover self-rescue if it gets stuck or bogged.
11. Moving parts on the rover will probably need lubrication but dust would clog grease or oil which is normally used. What could you use instead?
12. What accessories or tools should be included on your rover design? Think about lights, cameras, sensors, grabbers or samplers and, storage places.



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In the space below, brainstorm all the ideas you have about how you could investigate the project area.

When you were brainstorming, were there some things that you found you need to know more about? Write those down here. You may like to use the [PALMS5 STEM Research Guide - Digital](#) to find out more about these things.





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Scientists all over the world organise the way they think about and carry out their work in the same way - we call this the *scientific method*. They also write quite formally in the 'third-person' style (not using phrases such as 'you', 'we' or 'I').

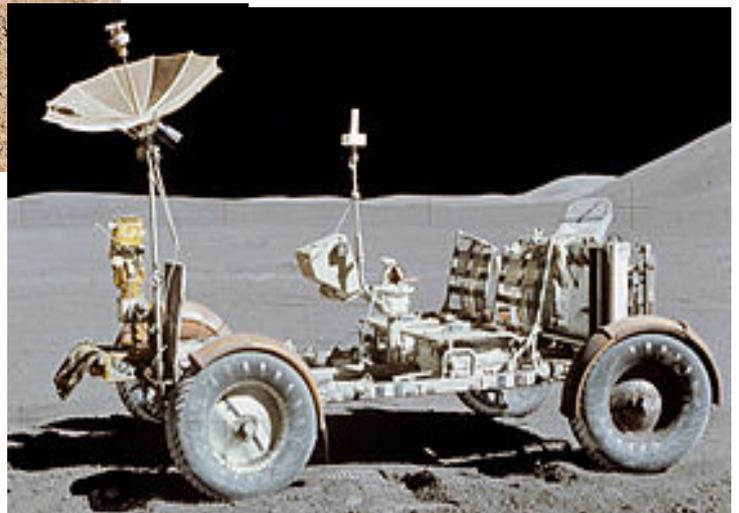
To try and solve your part of the STEM problem and meet the challenge, you will need to design and build a model. The [STEM Project Design Process Worksheet](#) on the following pages will help you with this process.

It is important that you include as much detail as possible so your design could be built by anyone who reads it. If you have trouble attaching pictures or need to submit your work in a different format, contact your teacher.



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### *STEM Project Design Process Worksheet*

Do I have a clear understanding of the problem I need to solve? Write the problem in one or two sentences.

How will I test my solution? Remember that you may only be able to build a smaller model of your real-life design.

What materials will I need to work towards a solution and test it?

List any special tools you may need to use. e.g Brush, hammer, clamp





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What do I need to do or use to make sure I work safely?

Draw a first draft of a diagram to show your planned design and take a picture. Upload the picture by clicking on the icon here:

If that doesn't work, send the picture separately but write here what the name of the file is:





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How much will your planned model cost and are all the materials and tools available to you? Where will you get them from? You may need to check with adults at home.

Review your design and make any changes needed. Make sure it is well labelled! Take a picture. Upload the picture by clicking on the icon here:

If that doesn't work, send the picture separately but write here what the name of the file is (it should be different to your draft):





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How will you record your progress? (choose an option)

**Check your design with your teacher before starting to build it.**

Once your design is approved by your teacher, go ahead, and gather your equipment and build a prototype model!

Take pictures or a video if you can, to show your model.



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## STEM Project 1C - Rover Design

### *Could It Be Better?*

Once you have carried out your experiments, built and tested your prototype or programmed and tested your solution, you need to review your ideas and work. In this section, you can identify any problems or difficulties you encountered and suggest ways you could improve your project if you were to start again.

These questions will help with your review process. Write or draw your ideas for improvement in the table below.

- Do you currently have access to enough of the materials you used to make a full-size model? Is there enough of it available in Australia? On Earth?
- Will current technology be useful, or do you need something more, something faster or better?
- Estimate how much it would cost to put your plan in place.
- Estimate how long it would take to put your plan in place.
- Can you do all of this yourself or do you need to bring in some experts? Who might these experts be?
- Did your design give you enough information to build a rover tomorrow? What further experiments or tests might you need to do?





## STEM Project 1C - Rover Design

Problem encountered	Possible Solution
Any other ways to improve your solution if you have unlimited resources, time and access to the best people!	





## STEM Project 1C - Rover Design

### *Report Back To Base*

To finish off your STEM Project, you need to let everyone know what you found out and what solution you came up with for your problem.

There are many ways you could present this, and your teacher may ask you to do it a particular way or have you come up with your own ideas. When writing or making your presentation, make sure you think carefully about who your audience is and how much detail you need to include. More visual presentations (colourful or with lots of pictures) are always more interesting.

Whatever kind of presentation you end up doing, you should cover the following things:

- What you found out or discovered that you didn't know before.
- What you designed, built, programmed or tested.
- The STEM skills you used (problem solving, creativity, critical analysis, teamwork, independent thinking, communication, digital literacy)
- How you could better investigate the challenge if you had no limit on resources or time.
- The most challenging aspect of the project.

### Don't forget!

- Save this file as a PDF and submit it to your teacher. Don't forget to include your name!
- Check that any photos have uploaded or send them to your teacher separately (tell them the file name)
- Submit your Report Back To Base presentation to your teacher.

