

Research Topic Hints

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You have been assigned one of the following topics as part of a group. You will need to research aspects of the topic in order to produce a presentation for the rest of the class. The following notes give some hints and tips of what you should look out for in each topic. You need to cover all the points raised in the tips, but you can extend your research further into aspects that interest you.

A house on Mars

The prime landing area for SpaceX's Alpha base has the following characteristics:

- Low-lying plane
- Sub-surface water ice
- Volcanic tubes

You should consider the advantages of each of these features. In particular:

- Research the formation of volcanic lava tubes; talk to your geography teachers.
- See if you can find on the internet images of lava tubes, both on Earth and on Mars.
- Research what the advantages are of using lava tubes as habitats on Mars, in particular look out for any references to radiation protection.
- What are the advantages of having sub-surface water ice available? It is not just the obvious drinking water. Research the process of creating oxygen from water; talk to your chemistry teachers.
- How would you go about generating electricity for the habitat?
- Come up with a basic design for a Martian habitat using a lava tube. Discuss crop growing with the team looking into that and the construction materials with the industry team. You can also discuss the material availability and construction with your DT teachers.

Present your results to the rest of the class.

Living off the land

People who want to live on Mars will need to use the materials present to provide essentials, such as food, air and water.

Find out how to go about growing plants on Mars. You can research on the internet, but you should also talk to your biology teachers in order to check your understanding.

Consider the following:

- What are the essential things that plants need in order to grow?
- How available are these things on Mars? Compare between Mars and the Earth.
 - Watch out for sunlight, atmosphere, UV, radiation and the Martian soil (called *regolith*)
- What can be done to compensate for any lack in the Martian environment?
- What are the essential nutrients and minerals that humans need to live? Can you design a Martian diet that will provide everything that people need?
- Come up with the basic design for a crop-growing building. Discuss this with the team dealing with housing. Do you want your building to be inside or outside?

Present your results to the rest of the class, including your design for a crop-growing building and a Mars lunch menu.

Martian industry

Although *SpaceX* plans to send ships to Mars carrying 100 tonnes of supplies, it will still be necessary to make materials on Mars for construction and other purposes. You need to research and consider how to make these (you can consult your DT teachers as well):

- Construction materials such as iron
- Clay and hence pottery and ceramics
- Glass from silicon
- Other materials that can be made using glass fibres
- Rocket fuel (methane) from the atmosphere

In each case there is information available on the internet, but also you should talk to teachers in the relevant subject areas. Discuss the availability of construction materials with the House and Living off the land teams, who will need the resources that you can make.

The Martian village

If *SpaceX* manages to develop the *Starship*, then 100 people could be transported to Mars on each flight. You need to consider / research:

- What skills will be required? Don't just think about the skills of living on Mars in terms of growing plants and construction. You will need scientists and engineers as well as cooks. Are there any other professions that need to be present?
- What balance of people should be on the flights? What is the best ratio of men to women? What range of ages: what is the youngest age you would consider? (Younger people are fitter and more mentally agile yet might not be so willing to commit to a long voyage.) What is the oldest age? (Older people are not as

physically robust, but have more experience and skill; they might also be more willing to have 'one last adventure' and be prepared to die on Mars.) Should families be sent? What range of nationalities should be represented?

- What system will be used for government in the Martian village? Should it be run like a military base with officers making decisions under one overall commander? Alternatively, should there be an elected government? Is there a need for a currency on Mars?
- What will people do to entertain themselves? Consider the environment on Mars – can you think of any different types of sport that might develop on Mars?

Report back to the rest of the class on your findings and conclusions.