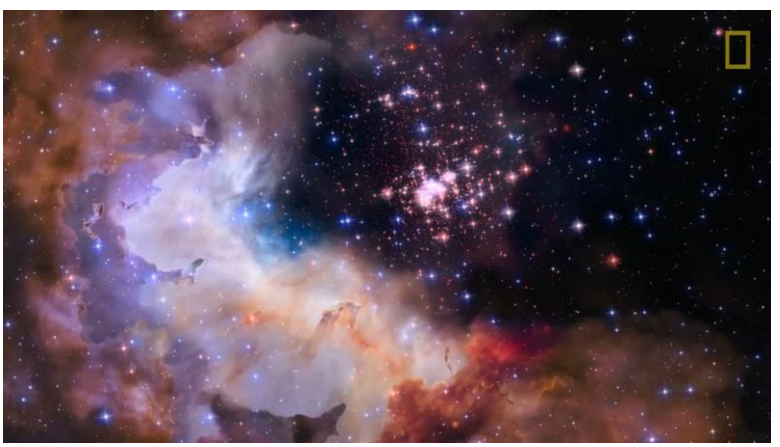
Mars Habitation: Background Briefing – Mars The Planet

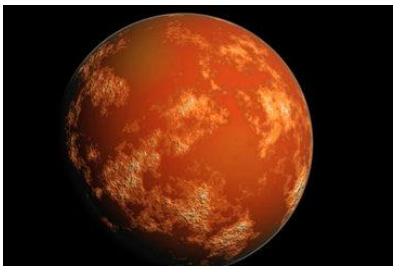
Watch the Video: Mars The Planet

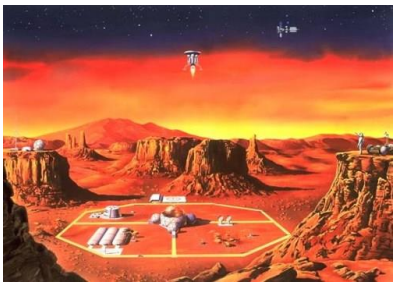


Background:
The Colonisation of Mars

Despite the vast distances from earth, and its relatively hostile climate, scientists are still investigating how we can inhabit Mars. Major space organisations such as NASA have a goal of getting to Mars in the next 10 years, then colonising the planet shortly after. Space vehicles such as the Mars Science Laboratory Curiosity rover has been gathering data for the past 7 years to help plan how to protect the astronauts who will explore Mars. Undoubtedly, the habitation of Mars will be one of the most ambitious undertakings known to humanity.

This case study is not intended to be an in-depth exploration of Mars Habitation. The aim is to examine the complex systems that will be represented by Mars Habitation, and appreciate how taking a systems thinking and systems engineering approach to examining Mars Habitation will aid our understanding of the associated challenges and opportunities, and help us be prepared!





Some key players in Mars Colonisation

LOCKHEED MARTIN

国家航天局 China National Space Administration

NASA

SPACEX

इसरो ISRO

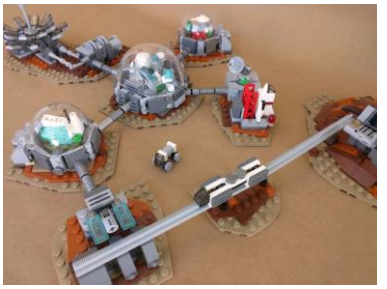
esa

BOEING

ROSCOSMOS

Mars colonisation is a complex multi-stakeholder programme. Many private organisations are becoming involved, working in partnership with the space organisations across the globe.

Mars Habitation: Considerations



There are so many things to think about in creating a safe habitation on Mars including:

- How to get people, materials, equipment there and back from Earth?
- What equipment is needed to build a suitable habitation?
- What sort of environmental control is needed to keep people healthy?
- What groups of people are going to be needed to support a colony, and with what expertise?
- What type of habitation will be needed?
- What will people do there – space mining, planetary exploration?
- How will people eat & drink sustainably?
- How will they work, relax, sleep, spend their free time?
- How will the colony communicate with earth and potentially with other Mars colonies?

Background: Malaysia Mars Habitation Programme

The Malaysian Government has recently reconfirmed its commitments to the National Space Industry and has expressed a desire to accelerate the Mars Habitation Programme. It has contracted Malaysia Space plc to coordinate development and build of the habitation units on Mars.

Progress of the preparations for a series of manned flights to Mars has been steady. The decision to plan for the creation of human settlements on Mars by 2027 has meant that several projects for associated supporting services and infrastructure now need to be accelerated. 'Malaysia Space' has responsibility for the development of the space launch and landing infrastructure and the transport of people and equipment to Mars.

It is recognised that human space exploration is dangerous at all levels. Yet after more than fifty years of humans traveling from Earth to space, the risk of space flight has proven to be similar to that of climbing Mount Everest.

Mars is an unforgiving environment where a small mistake or accident can result in large failure, injury, and death. During and after launch, transportation and landing on Mars every component must work perfectly. Every system (and its backup) must function without fail or human life is at risk.

The desire of the Malaysian Government is to ensure that the Mars Habitation Programme establishes Malaya as a credible industrial and space exploration partner for established 'space exploration' nations such as USA (NASA), China and European Space Agency.

Malaysia Space has decided to run a competition for a **concept study into the design of the logistics and critical facilities** for establishing the Station's **Mars Living and working Quarters (MLQ).**

You work for '**Extreme Habitation (EH plc)**' a company with an established market position developing, building & installing habitation systems in extreme polar, desert and sub-sea monitoring and research stations. EH Directors have instructed your team has been invited to participate in the system concept challenge that demonstrates that EH has carried out the systems thinking and system concept development that will convince Malaysia Space to select EH as a prime contractor.

Your business development director has asked that you carry out three pieces of work to illustrate the key system development approach you plan to take. Four work packages have been identified for this initial path-finding piece of work:

1) Clarification of Goals and Development of Rich Picture.
2) Development of a Concept of Operations for selected system(s)
3) Development and prioritisation of key stake-holder requirements
4) Presentation of Findings to Programme Director EH plc

Mars Habitation Case Study: 1

Development of goals and creation of a future state rich picture

In this session you will develop some high level goals and create a goals table for Mars Habitation and create a rich picture of Habitation on Mars.

The aim of this session is to also think about what habitation will be like and what systems will have to be considered e.g. environmental controls, food generation & consumption (eating), water reclamation, waste management, communication with Earth, transportation (to & from Mars, on surface of Mars), research and exploration, sleeping and relaxation etc.

Which stakeholders can you identify from the Rich Picture? Create a stakeholder map grouping the stakeholders around one or two of the systems necessary for life on Mars.

Mars Habitation Case Study: 2

Create a 'Concept of Operations' (ConOps)

Taking your defined goals, rich picture, stakeholder map as your starting point, and using methods such as SIPOC, your task in this session is to create a ConOps diagram for one of the systems necessary for life on Mars e.g. transport of materials to Mars, transport and construction of habitation units, building of food growing environments, waste management, water reclamation etc..

You may also have to refine and further develop the stakeholder map i.e. consider stakeholders and operational scenarios not previously identified.

Mars Habitation Case Study 3:
Define and prioritise requirements

From the previous Exercise select 3 stakeholders that are critical to the development of the ConOps you created for selected system(s) of the Martian Habitation programme. Identify 2 key needs or requirements per stakeholder and use a pairwise comparison to prioritise the 6 requirements.

If you have time, use the Customer Voice Table template to help identify Solution Design Requirements that would satisfy those prioritised requirements.
Finish the exercise by thinking about what you would do next to ensure a systems thinking approach is taken to completing this exercise.

Mars Habitation Case Study 4:
Presenting back

The Mars Habitation is worth 10% of your total module mark

Your team will be given 10 min + 5 minutes of questions to explain to the EH Programme Director:

- Your goals and goals table
- A future state rich picture and concept of operations
- Stakeholder map,
- Prioritised requirements for key stakeholders
- What's next – high level plan?

As you have only 10 minutes, you will need to focus on pulling out the key points from the presentation.
A maximum of 5 slides/ flip charts should be used.