Colonizing Mars One Step at a Time

Team: Martians
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Long Term Needs on Mars

- Lasting structures for habitat
- Growth and evolution of Botany on Mars for sustainable food resource
- Use of Martian resources to minimize cost and time between interplanetary travels
- Reusing of waste (Human/Environmental)

Getting to Mars

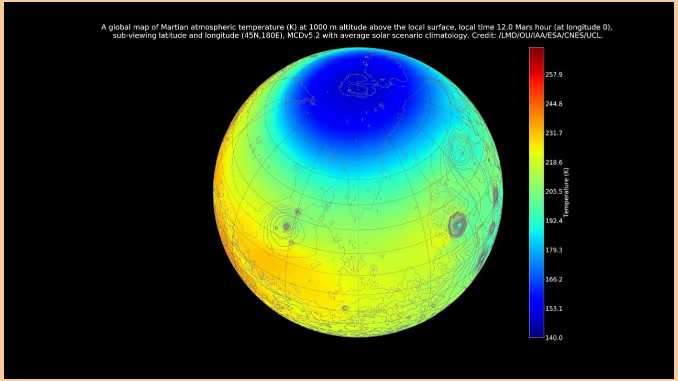
- Current rockets are not able to carry much payload (~5% of mass) to the low earth orbit (and lower to mars) meaning taking a lot of materials would not be a viable option
- It takes about 150-300 days to get to mars depending on the speed of the launch, and how much fuel we are willing to burn.

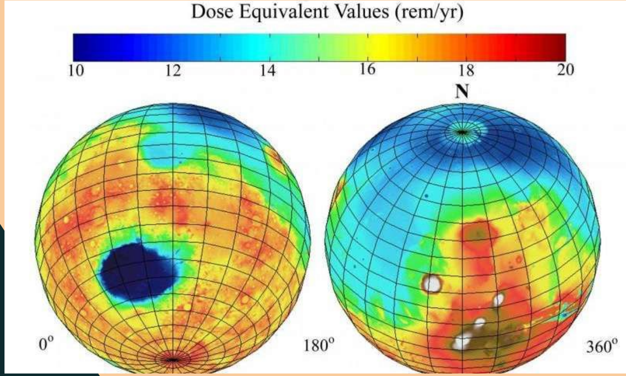
Robots before Humans

- Before sending humans to Mars, it would be smarter to send robots in order to create a habitat for humans to live in
- The process would require automated robots capable of 3D printing and shielding the 3D printed materials
- Along with that they should be able place systems that allow oxygen generation

Habitable Structure Design Criteria

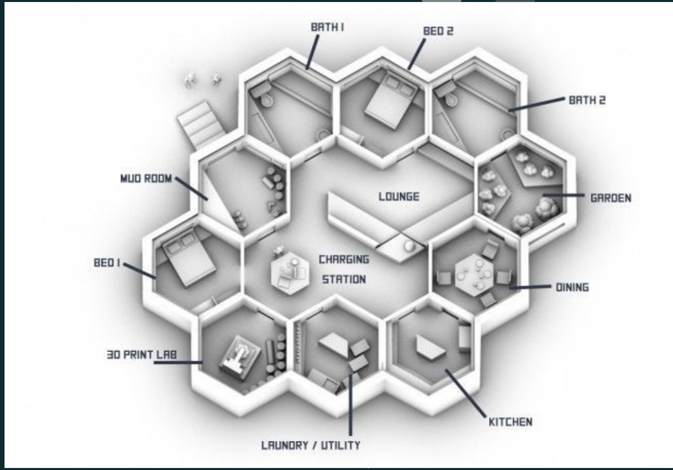
- Rigid to withstand extreme conditions
- Must withstand solar radiation
- Immune to severe temperature changes
- Environmentally friendly with minimal waste
- Cost-effective

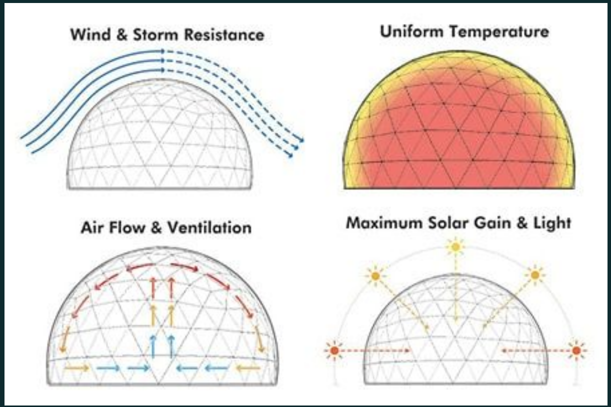




Our Structure Design Features

- Our design will incorporate hexagonal towers due to the fact that hexagons are proven to be the strongest shape in nature
  - Use of hexagonal design will ensure that strong winds, sand storm and marsquakes (Very Rare) cannot impact lives
  - Hexagons can also be easily connected similar to bee hives which can help make more rigid structures however failure of one will not affect others (for future expansion)
  - Double sealed and pressurized entries will be available on two sides of buildings along with pressurized rooms inside in case of an emergency





Materials

- Usage of sulfur concrete to make a strong base
- Requires heating sulfur and an aggregate (sand, gravel, etc.) to above the melting point of sulfur and cooling it
- The martian soil has the calcium and carbon found in limestone to create sulfur concrete on mars.

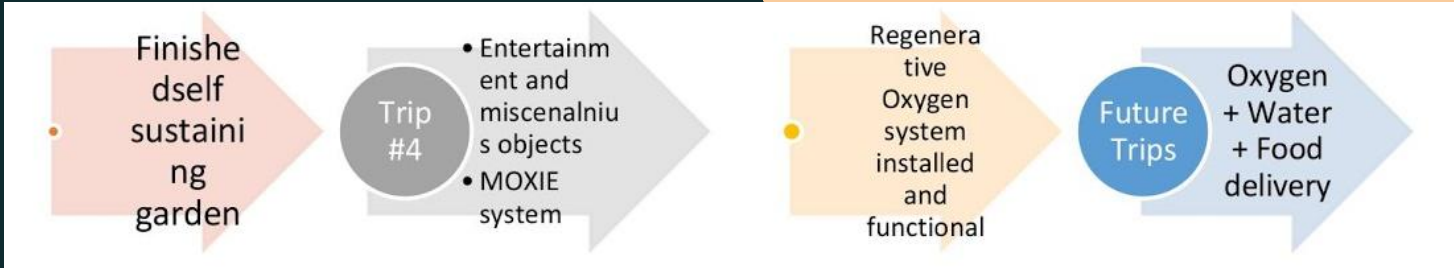
Admixtures

- Though sulfur concrete is strong, it can easily melt when exposed to heat
- Admixtures can be added to sulfur concrete to prevent it from burning until 240 degrees fahrenheit.
- Admixtures are natural or manufactured chemicals which are added to the concrete before or during mixing.

Sustainability of Structure

- In order to live on mars permanently the 5 habitants must slowly stop relying on earth resources
    - Botany can be easily incorporated on Mars and in our structures
        - This will be done by using human waste (Solid/Liquid) alongside filtration system. This will minimize food transport from Earth
        - Growing crops is also beneficial due to photosynthesis and production of Oxygen by plants.
        - Oxygen can also be generated by a similar system developed by MOXIE taking advantage of the ~96% carbon dioxide in the atmosphere


Trip #1
Automonus Robots accompanied by basic material
Basic working capsule and structure start to end
Trip #2
• Human Passengers + sustainable building materials
• Waste and water filteration
Rigid structure + pressurized capsules + oxygen tanks installed
Trip #3
Botany resources (Seeds + equipment + Fertilizers)


Finishedself sustaining garden
Trip #4
• Entertainment and miscenalnius objects
• MOXIE system
Regenerative Oxygen system installed and functional
Future Trips
Oxygen + Water + Food delivery

Sources

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The End