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A Short Paper On Mars - Based Settlements

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A SHORT PAPER ON MARS - BASED SETTLEMENTS.

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Abstract

This paper explores some ideas of how efficient Mar-based settlements would look like in a futuristic time. The main idea is micro-climating zones, then building up on those previously established habitable zones.

1. INTRODUCTION

Mars, also called the Red-Planet presents a gargantuan challenge for humankind not only in terms of the logistics of moving infrastructure and people there, but also the harsh living conditions.

In popular science magazines several ways of making life more bearable and cost effective have been put forward. The most common are : terraformation - making the planet resemble earth through introduction of earth ecosystems there like trees, water and organisms involved in the food chains ; there's also bunker-like buildings which mimic earth conditions like gravitational constant(affecting atmospheric pressure), air compositions and biodiversity, [1, 2] .

In this paper we'll try to simulate a method resembling the latter. Instead of fortified bunkers we'll think of Green Domes - protective domes resembling green houses of earth.

2. MARS

Challenges for the first voyagers.

- Lethal radiation like cosmic rays since there's no ozone layer cushioning human DNA
- Drastic temperature changes. Due to the absence of clouds, the temperatures are expected to be extreme both during the day and night.
- Air composition in Mars. Most earth organisms require oxygen for survival.
- Sandstorms and strong winds. There are no windbreakers expect maybe for naturally occurring barriers like hills and raised surfaces,[3].

For the above challenges, a micro-climate inside a 'greenhouse' which might be in the form of a dome(doesn't have to be semi-spherical, whatever presents lesser engineering problems) would come in handy , especially if the settlement occurred before the terraformation actually begun.

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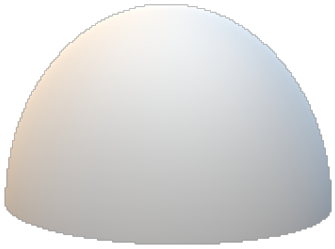

fig 1 :Dome

For instance a hypothetical dome could be easily engineered in the current technological era thanks to the magic of 3-D printing.

Such a dome could be ideal for housing several houses and within it a regulated climate with oxygen or an assortment of gases mimic those of earth.

Chaining Several Domes

One dome wouldn't be ideal for making freely traversible landscapes because of wear and tear but also accidental occurrences or just human sabotage. The consequences of such a breach would be deadly if the people weren't well equipped or were somehow precarious about the situation.

So how do we circumvent such an issue ? One possible solution could be building a larger dome enveloping several domes. Firstly, this would act as insurance in case an inner dome went into disrepair, it'd also act as a buffer from stray objects. Secondly, by having a very large dome it means we can do very space intensive activities like agriculture and manufacturing. Thirdly, the space could also be used for forestation and control experiments for plants to be introduced into the open during the terraformation process.

Other hindrances

Domes too wouldn't still be one hundred percent invincible, seismic activities could still do major disruptions of infrastructure . In such a scenario, it'd also require an evacuation area, preferably reinforced underground in case of large impact phenomena hitting on the domes.

Evacuation, Distribution and Communication

Having one dome mega is dangerous as previously noted because it presents risks and also prevents rapid expansion without disruption of events inside it.

We can easily compensate for this through distribution as we do with servers here on earth. Distribution also minimizes the high impact losses e.g during a mars-quake(an seismic shake on mars). In addition, it also gives space of expansion and experimentation areas.

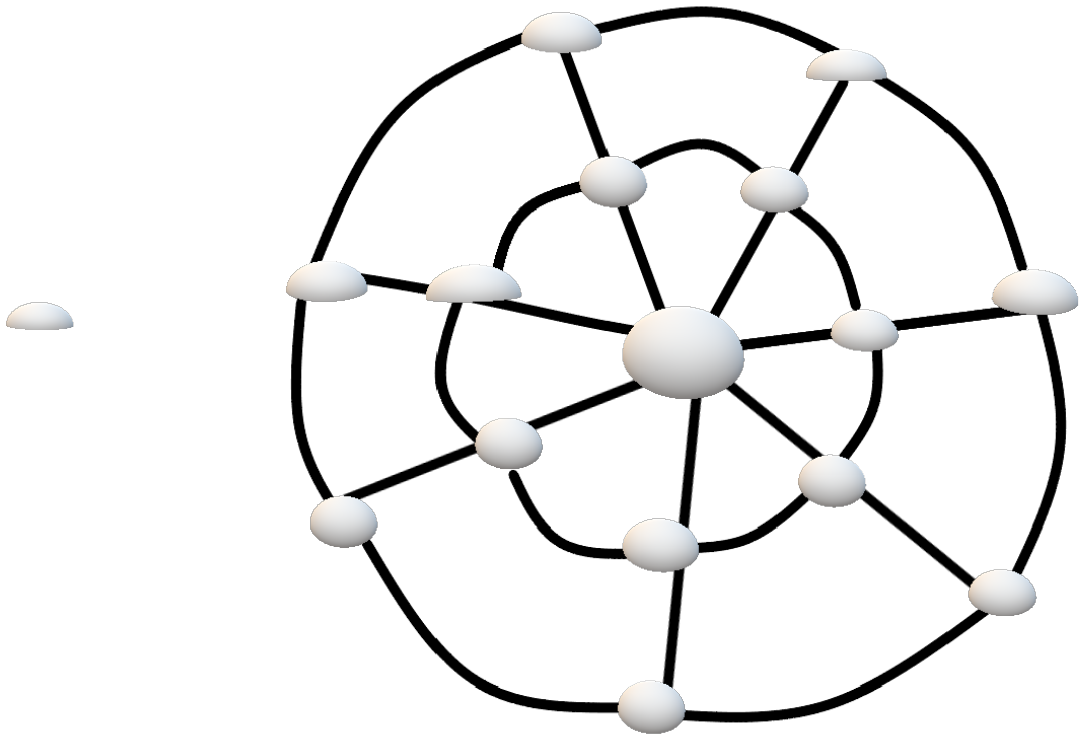

fig 2 : Network of Domes

Creating a network of domes could solve issues like evacuation, specialization of areas according to purpose and decongestion. The black lines indicate interconnection either through underground transport or above ground roads or railway. Underground interconnection however seems more feasible because of less exposure and also ease of access once the tunnels are dug. Such tunnels could be essential for the movement of supplies especially water and air if need be.

3. SCALLING UP

Life forms(including human beings) don't like restrictions of space and the limits of their travel, perhaps one of reasons for being a space-faring species. Soon even a large dome could also feel claustrophobic at one point in time. That's then when it requires scaling up.

One such requirement would be to deal with the cosmic problem of the sun's and other stray radiation . One solution would be to introduce particles in the stratosphere or very high up in the sky. This would act as a blanket of some sorts .

Now with the elephant in the room taken care of , people can now even make semi-conditioned zones with large forest covers to compensate for the convectional inflow of mars gases from outside .

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