Mars Construction, LLC

Title: Habitat Design (Phase I in progress)

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Design Variables need to be defined:

Habitat's for Lunar and Mars surfaces.

Habitat Design using Caves & Lava Tubes used as Habitats and Emergency shelters to minimize or eliminate radiation
exposure to humans, plants & livestock.

Caves of Mars Project (NASA) Results ae shown in following:

[1], [2], Caves and other underground structures, including Martian lava tubes, canyon overhangs, and other Martian cavities would be potentially useful for manned missions, for they would provide considerable shielding from both the elements and intense solar radiation to which a Mars mission would expose astronauts. They might also offer access to minerals, gases, ices, and any subterranean life that the crew of such a mission would probably be searching for.[3]

The program also studied designs for inflatable modules and other such structures that would aid the astronauts to build a livable environment for humans and earth creatures.[3]

The report answers questions:

- It is surmised that atmosphere temperature variations are less experienced in caves than on the surface of Mars.
- Caves protect lifeforms and equipment from harmful solar and galactic radiation.
- Caves protect from dust storms and micrometeorite impacts.
- Exploring caves is a key scientific interest as it makes it easy to study the geology, history, and possible presence of life on Mars without heavy excavation equipment.
- The ability of pressurizing caves to make them more habitable to human lifeforms.
- Allows the easy extraction of subsurface materials such as ice and minerals.

It also describes the "Essential Tasks" necessary for cave habitation. These are:

- Finding extraterrestrial caves
- Protecting the scientific environment inside of a cave
- Dealing with the dark (providing lighting solutions for the interior of the habitats)
- Cave Life support

Design Specifications:

Height:
Length:
Volume:

Wikipedia –

[1], [2], **Future human habitation** - The interior of lava tubes, along with other subsurface cavities, could prove to be prime locations for future manned missions to Mars by providing shelter for habitats.[1] These natural caverns have roofs estimated to be tens of meters thick which would provide protection from the extreme conditions that would be experienced on the surface.[3] The habitat would be protected from solar radiation, micrometeorites, extreme temperature fluctuations (ambient temperature is believed to be stable in lava tubes), winds, and regolith dust storms which could pose a threat to human health and technology. These natural shelters would also reduce the landed payload mass for manned missions which would be economically advantageous.[1]

[1], [2], **Lava tube conditions** - Lava tubes represent prime locations for direct observation of pristine bedrock where keys to the geological, paleo hydrological, and possible biological history of Mars could be found. The surface of Mars experiences extreme temperature fluctuations and receives a high amount of Ionizing radiation due to the lack of a magnetic field and the planet's thin atmosphere, which is about 100 times thinner than Earth's. The thin atmosphere allows Mars to more easily radiate heat energy away, so temperatures near the equator can get up to 21 °C (70 °F) during a summer day, and then drop down to −73 °C (−99 °F) at night.[10] Subsurface conditions on Mars are dramatically more benign than those on the surface, which lead researchers to believe that if life did (or does) exist on Mars, it would most likely be found in these more hospitable environments.[11] Life forms would not only be protected from the high surface temperatures and ultraviolet radiation, but also from wind storms and regolith dust.[1] Martian lava tubes could possibly trap volatiles such as water which is considered essential for life, and may also contain reservoirs of ancient ice since cold air can pool in lava tubes and temperatures remain stable.[3] The ability to tap into these reservoirs may provide dramatic insight into the paleoclimatology and astrobiological histories of Mars

Lava tubes could be detected through the use of:

- Ground-penetrating radar
- Gravimetry
- Magnetometry
- Seismography
- Atmospheric effects
- Lidar
- Infrared
- Human or robotic exploration[3]

Mars Caves & Lava Tubes Reference:

1. Google search (Mars caves) – Human Utilization of Subsurface Extraterrestrial Environments Report by NASA,
   Astrogeologists discover shallow caves that could provide Shelter for Life on Mars by US Geological Survey
2. Wikipedia search (Mars caves) – caves of Mars Project by NASA by NASA
   The Caves of Mars Project (NASA) was an early 2000s program funded through Phase II by the NASA Institute for Advanced Concepts[1][2] to assess the best place to situate the research and habitation modules that a human mission to Mars would require.[3] The final report was published in mid 2004.[3], Martian Lava Tube by NASA, and Canyons.

3. Olympus Mons (located in 3DS Mars) largest extinct volcano in our solar system, need to locate lava tubes to
   see if they are usable. Also look at Mariner Canyon for caves in canyon outcrops.
4. Blueberries – hematite is (Fe2O2) iron oxide based or consisting of ferric oxide, (located Mariner Canyon) Can
   they be used for building construction, already on surface in abundant supply.

www.youtube.com

The Mars Homes That NASA Awarded $500k, robotic habitat construction

THIS Is How We Build On Mars (3D Printing, Habitat, clothing)

What has NASA's HiRISE seen over some of Mars' most interesting craters?