Mars Analog Research Stations

Laboratories for learning how to live and work on another planet

http://www.marssociety.org/mdrs/mdrs01a.asp

Each MARS-Hab serves as **a prototype** of a habitat that will land humans on Mars and serve as their main base for months of exploration in the harsh Martian environment. Such a habitat represents a key element in current human Mars mission planing. Each Station's centerpiece is a cylindrical habitat, "The Hab," an 25 ft. diameter, two-deck structure mounted on landing struts. Peripheral external structures, some inflatable, may be appended to the Hab as well.

Each station will serve as a field base to teams of **four to six crew members:** geologists, astrobiologists, engineers, mechanics, physicians and others, who live for weeks to months at a time in relative isolation in a Mars analog environment.

Mars analogs can be defined as **locations on Earth where** some environmental conditions, geologic features, biological attributes or combinations thereof may approximate in some specific way those thought to exist on Mars, either at present or earlier in that its history. Studying such sites leads to new insights into the nature and evolution of Mars, the Earth, and life.

Such analog environments will also offer unprecedented opportunities to carry out Mars analog field research in a variety of key scientific and engineering disciplines that will help prepare humans for the exploration of that planet. Such research is vitally necessary. For example, it is one thing to walk around a factory test area in a new spacesuit prototype and show that a wearer can pick up a wrench - it is entirely another to subject that same suit to two months of real field work. Psychological studies of human factors issues, including isolation and habitat architecture are also only useful if the crew being studied is attempting to do real work.

When considering the effectiveness of a human mission to Mars as a whole, it is clear that there is an operations design problem of considerable complexity to be solved. A mission will involve diverse players with different capabilities, strengths and weaknesses. They will include the crew of the Mars habitat, pedestrian astronauts outside, astronauts on unpressurized but highly nimble light vehicles operating at moderate distances from the habitat, astronauts operating a great distances from the habitat using clumsy but long-endurance vehicles such as pressurized rovers, mission control on Earth, the terrestrial scientific community at large, robots, and others. Taking these different assets and making them work in symphony to achieve the maximum possible exploration effect will require developing an art of combined operations for Mars missions. The MARS project will begin the critical task of developing this art.

Three Prime M.A.R.S. Project Goals:

(1) **As effective testbeds for field operations studies** in preparation for human missions to Mars specifically. They will help develop and allow tests of key habitat design features, field exploration strategies, tools, technologies, and crew selection protocols, that will enable and help optimize the productive exploration of Mars by humans. In order to achieve this, each Station must be a realistic and adaptable habitat.

(2) **Useful field research facilities at selected Mars analog sites on Earth**, ones that will help further our understanding of the geology, biology, and environmental conditions on the Earth and on Mars. In order to achieve this, each Station must provide safe shelter and be an effective field laboratory.

(3) **Generate public support for sending humans to Mars.** They will inform and inspire audiences around the world. As the Mars Society's flagship program, the MARS project will serve as the foundation of a series of bold steps that will pave the way to the eventual human exploration of Mars.

Mars Analog Research Stations will be operated by Mars Society researchers and will be made available to NASA and selected scientists, engineers and other professionals from a variety of institutions worldwide to support science investigations and exploration research at Mars analog sites.

As an operational testbed, the stations will serve as a central element in support of parallel studies of the technologies, strategies, architectural design, and human factors involved in human missions to Mars. The facilities will also bring to the field compact laboratories in which in-depth data analysis can begin before scientists leave the field site and return to their home institutions.

The Stations will help develop the capabilities needed on Mars to allow productive field research during the long months of a human stay. The facilities will evolve through time to achieve increasing levels of realism and fidelity with the ultimate goal of supporting the actual training of Mars-bound astronauts.

A Multi−year Project with Phases

The Mars Analog Research Station program is conceived as a multi-year, phased project to enable distribution of the required budget over a period of time. In addition, phasing the project gives the Mars Society the flexibility to incorporate design changes and new technologies in response to knowledge gained each field season.

The first step in the plan was accomplished in 2000 with the construction on **Devon Island** of the **Flashline Mars Arctic Research Station**. In the summer of 2001, Flashline was operated for two months in Mars operations simulation mode. Also, in 2001, we began development of an analog pressurized rover that can be used either independently or in combination with Flashline or other MARS project field stations.

Work on the first of these other units, in the American southwest (**Utah**), also began in 2001, with commencement of simulation operations beginning in 2002.

In 2003, two more stations will be established; one in the basaltic and geothermally active deserts of **Iceland**, and the other in the Austrian outback (**South Australia**), whose ancient deserts contain fossils which date from the same period when Mars' surface ran with liquid water. Each of these additional stations offers unique new advantages to the MARS program.

Utah: Because of its ease of access, the Mars Desert Research Station in Utah is the ideal place to serve as a test bed for equipment that will later be sent to more remote and unforgiving locations. For the same reason, this station is the best place to begin long-duration isolation experiments

Iceland: With its geothermally active areas, Iceland best simulates areas on Mars where life might be found today, and thus it is the optimum location to practice Mars exobiology field work. In addition, with its European location, Iceland is well situated to act as a place from which the MARS project can act to inspire the European public with the challenge of the modern age's New World.

South Australia: Australia's ancient fossils are among the oldest records of life on Earth, and as such may mirror the kind of traces that life may have left on Mars. In learning how to look for such remnants within the constraints faced by Mars explorers, we will be teaching ourselves how to search for the record of the origin of life on our neighboring world.

[2002 - Text adapted by Wisconsin Mars Society from the web page cited above.]