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List of Acronyms

CERES	Controlled Environment for Research in Ecological-support Systems
CPRU	Central Processing and Relaying Unit
CPU	Central Processing Unit
DSU	Data Storage Unit
DTCT	Data Transmission and Command Transponder
IRGA	InfraRed Gas Analyzer
ISRU	In-Situ Resource Utilization
LED	Light Emitting Diode
LEO	Low Earth Orbit
M.C.	Mission Control
MCCS	Mars Cryogenics and Consumables Station
MDG	Mars Deployable Greenhouse
NASA	National Aeronautics and Space Administration
PAR	Photosynthetically Active Radiation
P.P.	Partial Pressure
PSG	Photosynthetic Generation
R&D	Research and Development
RCS	Reaction Control System
SDSU	Secondary Data Storage Unit
SSME	Space Shuttle Main Engines
VPS	Vapor Pressure Deficiency

Introduction

"Mission to Mars", more commonly associated with a Hollywood science fiction movie title, has been on the top of NASA's project list in current years. Mars is the most accessible planet believed to have the capabilities to sustain life. That is, life on Mars is not something only accomplished on the big screen. As with any space mission, the exploration of our neighboring planet introduces new scientific knowledge and technologies that could ultimately benefit mankind. A better understanding of Mars will ultimately open a window to the history of our own planet. Also, similar to the efforts and goals of the International Space Station, the exploration of Mars would bring international cooperation and inspiration to men and women young and old.

Exploration of planets can be categorized into three stages of mission objectives where each mission develops technologies to aid the next. The first stage is to flyby the planet, collecting as much information as possible. In November of 1964, NASA launched Mariner 4. The spacecraft reached Mars on July 14, 1965, taking the first ever close up pictures of the red planet. With stage one completed, NASA pushed on to stage two, orbiting the planet. Mariner 9, launched on May 30, 1971, became the first artificial satellite to orbit Mars obtaining information. The next logical stage from this point is to land on the planet and perform surface operations and experiments. This brings us to Viking 1 and 2. In 1976, NASA successfully landed two unmanned spacecrafts on the surface of Mars to perform experiments. The future of Mars leads in one direction from this point by landing a man on Mars. A manned mission to Mars requires the astronauts to be away from Earth for several years with a narrow window for return. Therefore, prolonged life needs to be preserved on the planet via a self-sustaining and life supporting greenhouse such as the Controlled Environment for Research in Ecological-support Systems (CERES).

Mission Goal

As the development of NASA's Mars Direct program proceeds, there will be an increasing need to support and augment the proposed manned missions. Because of the large distance and travel time to Mars, these manned missions must endure a longer duration than any other manned space excursion to date. Therefore the philosophy of the Mars Direct Plan encompasses In-Situ Resources Utilization (ISRU)[1]. The Mars Deployable Greenhouse (MDG) will support this philosophy by not only growing food, but by also providing a biological filter for the habitable atmosphere and waste products. The initial phase of greenhouse operation will be one mostly of research, determining viable options for further development, and as such will only provide a percentage of the total dietary needs of the crew. As the Mars Direct plan continues, however, the MDG will allow the logistical and financial freedom for the fledgling Mars base to host a large crew. Maintaining a minimal mass/minimal energy approach, the MDG will utilize solar collection to minimize artificial light as well as utilize the CO_2 rich Martian air for the greenhouse environment. The initial growing medium with be hydroponics due to the inconvenience of transporting earth soil to Mars, however an objective of the MDG will be to determine the feasibility of using Martian soil as a growing medium.