

Report for the Mars Society's Flashline Mars Arctic Research Station Project
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The Mars Society is a private international society dedicated to furthering the human exploration and settlement of the planet Mars. In July 2000, the Mars Society established a research facility at the Mars-like Haughton impact crater site on Devon Island, Nunavut, called the Flashline Mars Arctic Research Station (FMARS). This station has been operated during the summers of 2001, 2002, 2003, 2004, and 2005. Designed to simulate a landed spacecraft on Mars, the Mars Society's FMARS allows a substantial enhancement in the level of fidelity of human Mars exploration operations research on Devon Island. The FMARS project serves three goals:

- 1) To provide a testbed for studying the many aspects of field exploration operations on a human mission to Mars.
- 2) To provide a capable field research laboratory to help further our understanding of the Arctic, the Earth, Mars, and the possibilities and limits of life on our planet and beyond.
- 3) To inform and inspire people around the world to greater interest in space and science by bringing before them in a tangible form the vision of human exploration of Mars.

The research program carried out at the FMARS is unique. For an extended period of time, a six or seven person crew of scientists and engineers attempts to conduct a sustained program of field exploration in the 75 degree North polar desert of Canada's Devon Island, while working under the same operational constraints as a human expedition exploring Mars. The crew lives in a combination habitat/laboratory module that is an architectural duplicate of a Mars mission unit. Anyone leaving the station to do field research needs to wear a simulated spacesuit, that limited the mobility, agility, dexterity, and sensory abilities of the wearer much as a real spacesuit would, and communication between EVA team members separated by more than a few feet had to be done by suit radio. While in the station, crew members also perform laboratory analysis of samples brought in from the field, repaired equipment, write reports (which are exchanged with Mars Society's Mission Support group via a satellite link that imposes a Mars-like delay on communications), and engage in the chores of daily life living together as a team. The purpose of conducting such simulated operations is to gain essential knowledge of Mars exploration tactics, human factors issues, and engineering requirements – in short, to start learning how to explore Mars.

During the 2005 season, the six-person crew operated the station for 4 weeks. During that time, a series of pedestrian and motorized survey scouting excursions were done under EVA conditions to distances as far as 10 km from the station. These survey expeditions were then used to determine sites of greatest scientific interest, which were then investigated further with dedicated expeditions. Geologic samples from such sites were cataloged and classified, and the morphology of the sites analyzed to understand their geologic history. Biological samples were gathered and imaged under the station's

microscopes to search for endolithic bacteria of the same type that some believe may survive inside of rocks on Mars. A large number of fossils were discovered and identified, including bacterial stromatolites and Devonian corals. Experiments were done doing complex instrument deployment under EVA conditions. Experiments were also done in utilizing robots in combined human-robot field exploration operations. Human factors experiments were done, including examining the effects of reduced water use on crew effectiveness, and the role of exercise in sustaining crew fitness and morale..

In addition to the above, the crew of the stations engaged in substantial public outreach activities, with articles appearing as a result in US and Canadian print, internet, radio, and television media. Prominent among the coverage were two pieces authored by renowned columnist John Tierney, which appeared in *The New York Times*.

For budgetary reasons, no field operations were done during 2006. In 2007, however, we plan an extended season involving a crew of seven operating the station for a period of four months, beginning approximately May 1 and running through the end of August. This will be by far the longest simulated Mars mission conducted anywhere on Earth to date. A very high quality off-site team of scientists has been recruited to support the mission through consultation conducted through our satellite communication link. This will allow us and develop the art of sustained “telescience” collaboration between onsite explorers and Earthbound scientists that will need to be used when human astronauts finally journey to Mars.