



## Artemis Moonbase Simulation One

c/o The Moon Society

P.O. Box 940825

Plano, TX 75094-0825

MissionWeb: <http://www.moonsociety.org/moonbasesim/>

### **Component Integration into Complex Closed/Semi-Closed Systems (CICCS)**

Principal Investigator: Laurel Ladd

#### **General Principles**

My ongoing work in the area of Component Integration into *Complex Closed/Semi-Closed Systems (CICCS)* is based upon three fundamental principles.

The first is that although we cannot explore and colonize the space frontier without hardware and software, the exercise is futile without addressing the needs of the wetware. Manned spaceflight cannot exist without the humans.

The second is that current management theory and practice have little or no relevance to the type of humans embarking upon those missions or the conditions with which they must cope. Using volunteers from the general population and maintaining a Terran lifestyle during research does little to advance our understanding of the human problems.

Finally, we must recognize that it is insufficient to create an environment where humans can survive. Instead, it is necessary to develop strategies so that humans can thrive. Without alert, highly functioning individuals one might as well send machines.

While a two week sojourn with a small crew will not yield data of statistical significance, it is important to remember that this is a small, but crucial, portion of a much larger whole. Each opportunity to bring the research to life brings us closer to the stars.

#### **Modeling a Space Frontier Diet**

Without appropriate nutrition and hydration, the most talented of crews will succumb to lethargy and even illness. In order to reduce the risks, a well-balanced diet must be available. Unlike the typical Terran, it is not enough to juggle intake over several meals or even days. To maintain peak efficiency each meal should provide nutrient balance.

However, careful planning and preparation will be for nought, if people do not eat. Meal plans must include concern for appearance, aroma, variety, and interest. While I do not subscribe to the idea of using food as a morale booster, there is no doubt that the lack of interesting food is demoralizing. Obstacles withstanding, as a native of the frozen north, I do not believe that there is a substitute for bubbling soup and the smell of warm bread...yet.

Meal plans have been developed which contain recipes which can be made on site. These were chosen for adaptability to sim conditions and crew preferences. All can be created using lunar compatible tools and techniques. Ingredients are limited to items easily transported to the lunar surface or available from the greenhouse. The time frame for this specific simulation is three (3) months after initial set-up. Now we need to field test our work.

*For More Information on Artemis Moonbase Simulation One please contact:*

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During the first week, a rotation of crewmembers will prepare meals with instruction and supervision by the chief researcher. Dishes will be created primarily according to instructions and ingredients listed in advance. Feedback will be collected on a daily basis.

By the end of the first week we should have a substantial amount of information. At this point, adjustments can be made to accommodate the reactions of the crew. Not every crewmember will come on board with culinary experience. By the end of this crew rotation we will have sufficient material to produce a space frontier kitchen manual, containing not just recipes but crew-friendly instructions.

### **Kitchen Garden & Greenhouse**

The early space frontier diet will benefit from small fast-growing greenery. To those ends we will be growing several varieties of sprouts. The types chosen will be edible in three to five days.

In addition, we are delighted to carry on the greenhouse work of the Double X Crew. While we do not expect to consume produce from their efforts, we hope to ensure that crews later this spring will have that opportunity.

If this area of research is of interest to you, I recommend the work of Vik Olliver and his wife Suz, from Artemis, New Zealand. Among other topics, their work on lunar hydroponics is documented in the Artemis Data Book.

### **Physical Stress Management**

While cardio-vascular concerns have been given a prominent place in manned spaceflight research, much less attention has been paid to smaller scale muscular and skeletal concerns.

Whether on the lunar surface or in simulation, a proliferation of aches and pains is anticipated for crewmembers. Muscle aches, joint stiffness, and even repetitive strain injuries are common in extreme conditions. One does not need to have a chronic condition to experience neck and shoulder discomfort after a night in a new bed or a day at the keyboard.

Three methods of reducing the risk will be introduced during this crew rotation. An adapted form of seated Tai Chi, a routine of self-massage, and a list of appropriate isometrics will be at the disposal of the crew. Initially created to help participants in extreme low-impact camping, I anticipate a wealth of feedback from the individual crewmembers.

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