MISSION STATEMENT

LUNAR HOUSING SIMULATOR

~~Summary~~

INTRODUCTION

Rapid advancements in space technology in recent years forewarn as to the necessity for active advanced research in certain areas heretofore considered only theoretically.

The first celestial objective in space exploration will be the Moon. Exploration of the Moon can be only partially accomplished by instrumented vehicles alone. Man's presence on the Moon will be required to complete lunar investigations. These investigations will be long-term studies, which will extend over many years, and the construction of one or more operational lunar bases will be a requirement. At some point in time, an operational lunar base will become a way-station for journeys to the planets.

In order to be capable of constructing a lunar base by the time we have vehicles capable of transporting men to the moon, research and development on a lunar facility must begin now. The first item of importance is the design, and fabrication of a completely self-sustaining housing unit for X number of men.

The lunar house can be designed and built as an earthbound facility. Certainly every environmental factor prevailing on the moon cannot be duplicated on earth. However, the majority of the ecological problems can be duplicated and as more lunar data is gathered, ~~the other factors can be controlled.~~ these data can be utilized in design modifications.

This report

~~I should like to~~ describe ~~to you~~ an earthbound lunar housing simulator which can be utilized to solve known problems relating to lunar habitation, and to expose and facilitate the solution of problems not presently known.

Purpose

In this lunar laboratory, all known problems can be worked out in advance of lunar exploration. These problems include:

1. Structural design and modification. Prefabricated, modular design transported to + assembled on Moon with minimum of effort.
2. Development of a completely closed balanced ecological system containing the optimum proportions of man, animal and plant. The system would be completely self-sustaining after the initial supply of all necessary materials. This is an area which must be worked out before the attempt is made to establish the lunar base. All possible contingencies must be met in the lunar simulator. It would be fatal to wait to solve some problems after reaching the Moon. Includes atmosphere regeneration, food production, water and waste re-utilization.
3. Best location on the Moon surface for temperature regulation, protection from meteorites, and utilization of solar energy.
4. Solar energy research. Methods of control and devices best for various uses of solar energy in the lunar house.
5. Psychological problems involved in living in such a housing unit (reduced pressures, social interaction of group, selection of personalities, confinement and isolation), etc.)
6. Problems in modification of the basic structural unit for other specific purposes, i.e. lunar observatory, scientific laboratories,

production facilities for various products made from lunar raw materials.
7. Simulation of work tasks under lunar conditions (except for reduced gravity). Training procedures.
8. Simulation and handling of structural emergencies can be programmed, i.e. rapid decompression from meteorite puncture.
9. Simulation and handling of all types of biological emergencies within the housing unit; ie - failure of photosynthetic exchange system, human illness, animal disease, & crop failure.

Design

Design criteria for a basic lunar housing unit are dictated by four major ~~factors~~ considerations:

1. Physical environment on the Moon.
2. Man's normal range of physiological adaptability.
3. Transportability - weight and ease of assembly.
4. The mission of the ~~"Man on the Moon".~~ lunar unit.

Physical environment includes such factors as:

1. Lack of atmosphere (oxygen).
2. Lack of barometric pressure.
3. Temperature variation.
4. Duration of lunar day.
5. Meteorite intensity.
6. Intensities of cosmic and solar radiations.
7. Gravitational force.
8. Structure of the Moon surface.
9. Unknown factors.

Factors involved in man's normal range of physiological adaptability are:

1. Oxygen pressure of atmosphere.
2. Carbon dioxide pressure of atmosphere.
3. Temperature and humidity of environment.
4. Gravitational force.
5. Effects of and tolerance limits ~~of~~ to ionizing radiations.
6. Food and water supply.
7. Waste re-utilization methods.
8. Effects of prolonged habitation in reduced barometric pressures.
9. Control of toxic gases and materials.
10. Control of illness and disease.
11. Psychological effects of various facets of lunar living.

Factor three is obvious without explanation. (Transportability)

The mission of ~~"Man on the Moon"~~ lunar housing unit may include such design elements as:

2. ~~1.~~ Mobility and relocation of the housing unit.
3. ~~2.~~ Distance and time required to complete an expedition from the lunar base.
4. ~~3.~~ Amount and type of mobile equipment required for an exploring party.
1. ~~4.~~ Purpose for which the structure will be used.

Studies to be Conducted in the Simulator

1. Photosynthetic exchange system development and improvement.

2. Animal colony.
3. Hydroponicum (grains, vegetables, fruits).
   a. Use of moon soil for farming.
4. Recovery and re-utilization of water.
5. Waste processing and re-utilization.
6. Over-production, preservation and storage of produce.
7. Over-production, preservation and storage of oxygen and water.
8. Research on diurnal cycling.
9. Psychology of confinement and isolation.
10. Interaction of groups and personalities.
11. Model work ~~systems~~ schedules development.
12. Training for work in space suits; duration and type of activities tolerable.
13. Solar energy research.
~~14. Cosmic radiation research.~~ ?
14. ~~15.~~ Operational research program
    Effect of extreme brightness contrast
    Food preference and adaptation
15. ~~16.~~ Effects of sign and magnitude of ionized air on behavior of plants, animals and man.
16. ~~17.~~ Mutations of plants and animals to fill needs of the lunar base.
17. ~~18.~~ Structural design improvement.

~~Slides~~

Results of these studies are directed toward development of:

A. Permanent manned satellite. (MINIATURIZATION)
B. Interplanetary space craft. (SUB-MINIATURIZATION)

Conclusions

The magnitude of this task dictates that immediate planning be begun. Past experiences with very complex systems have shown that proper planning for such tasks is often undertaken at too late a stage for well-timed development.

It is mandatory that the Martin Company engage in Space Medicine research of this nature for several reasons:

1. To establish a Martin applied research facility and staff to which the customer would come for solution of problems and for consultation, in the area of closed ecologies.
2. As a research facility which the customer will utilize in training research personnel.
3. As an indoctrination and training facility for future Lunarnauts.
4. To augment the possibility of obtaining future major contracts by reason of a demonstrated human factors capability.
5. For prestige in possessing the first facility of this type in the world.

and,

6. Because ARDC SR-153 (now a P.R.) calls for the development of such a facility.