Statement of Work for the Lunar Housing Simulator

Part I

A. The behavioral science portion of the program for the Lunar Housing Simulator will consist of a chronological sequence of studies.

1. Lunar Housing Simulator Mission Analysis. This will require specification of the program objectives of a Lunar Housing Simulator relating to research problems associated with the life support system.

2. Specification of Item Tasks. Based upon the missions indicated, and upon the basic equipment installed in the Lunar Housing Simulator, types of tasks to be performed will be identified.

3. Detailed Task Analysis. Each of the types of tasks specified will be analyzed in terms of precise time-and-motion study detail.

4. Human Engineering Equipment Design Analysis. In every instance where there are interactions between man and equipment, whether of the information presentation type (e.g. instruments) or of the control manipulation type (e.g. O_2 control, temperature control, etc.), detailed analysis of design features of equipment will be effected to arrive at optimal design recommendations for maximizing crew member task performance.

5. Stabilization and Definition of Task Configurations. The results of detailed task analysis and of human engineering equipment design analysis will be interrelated to yield optimal task configurations.

6. Grouping of Tasks into Job Constellations. The numerous tasks will have to be grouped into a smaller number of integrated job constellations for economical performance with a minimum of time and activity expenditure.

7. Definition of Crew Member Roles and Assignment of Job Constellations to Crew Members. For the five-man crew planned for the Lunar Housing Simulator, specific roles must be assigned, such as, Engineer, Agronomist, Microbiologist, Physiologist, and Behavior Analyst (Psychologist). Authority levels must also be assigned, e.g. Commanding Officer, Deputy Officer, etc. Further, responsibility levels must be assigned for different types of technical decisions. Established job constellations will be assigned in this context.

8. Crew Activity Analysis with Reference to Job Interactions. Cooperation, facilitation, competition, and interference factors will be observed and evaluated. W-R-R (work-rest-recreation) schedules, simultaneous and sequential work load limits and their effects, effects of enforced inactivity of extended durations, optimal types and duration of recreational activity will be investigated.

9. Development and Modification of Social Behavior Patterns in Confined Crew Environment. Growth and deterioration of situationally generated social roles, development of unassigned leadership patterns, spontaneous appearance of undirected work relationships,

personality conflicts, and relationships between crew roles and social relations will be investigated, especially as they affect improvement or deterioration in crew task performance.

A. The physiological portion of the program will consist of collecting physiological data which will enable life scientists to determine the optimum atmospheric pressure and composition, food requirements, diurnal cycle, and other factors in designing the eventual life support system for lunar operations, as well as test the experimental environment. Analysis of this data should point out new problems for basic research.

Part II .

A. Test and Improve Environmental Maintenance System. Includes controls for the system and involves such equipment as photosynthetic gas exchangers, gas analyzers, temperature, pH and pressure sensing equipment, algal harvesting and processing equipment, data acquisition equipment, etc.

B. Test and Improve Food Production Methods (Growth, Preservation, Storage). Includes changes in crop selection and proportions of plants selected, as well as modifying nutrients and gaseous composition and pressure of the atmosphere surrounding the plants. Changes in kinds and proportions of animals to be included in the closed system. Modification of lighting systems for plant systems with regard to intensity, spectrum, and arrangements of lighting.

C. Test and Improve Waste Processing Methods for Re-utilization of Wastes as Plant Nutrients. One basic method would be used initially. Modification of this system will be made as required, and/or alternate methods will be utilized.

C. Test and Modify Emergency Procedures and Equipment. Simulate such emergencies as decompression, power failure, crop failure, failure of algal gas exchanger, human and animal illness, failure of waste processing equipment, gas analyzers and other critical equipment and instrumentation.

E. Test and Improve Crew Habitability Provisions (Sleeping and Eating Arrangements, Cooking at Low Atmospheric Pressures, Sanitary Facilities, Recreation Facilities, Noise Level and Control. Emphasis will be Placed on Health and Hygiene Measures).

F. The objectives stated in A-E will be carried out first at ambient (sea level) pressure within the sphere, followed by reduction of the total pressure to as low as 5.45 psia (25,000 ft.) to test the ability of plant systems, as well as the human and animal population, within the ecology to function efficiently at these pressures.