Waste Processing System *for L. H. S.*

The system is designed to convert the total combined wastes generated in the simulator into a nutrient effluent solution suitable for use directly in the hydroponic beds for plant production.

These wastes will consist of feces and urine from men and food animals, food preparation wastes from plants and animals, table scraps, and wash waters. Water volume will necessarily be restricted to a minimum. All wastes will be ground through "disposal" units at points of origin prior to entering the waste piping system in the central utility core.

Wastes will descend via pipeline through the central utility core into the mechanical equipment area, where they will first enter a homogenizer unit. This unit will grind and homogenize the waste into a suspension of extremely fine particle size range in order to present the maximum surface area for bacterial digestion activity.

The homogenized raw wastes will pass into one of several digester units through an automatic valving system. The units will be equipped for anaerobic digestion in stages, automatically controlled. Internal recirculation, temperature and pH control, and chemical tests will be incorporated in the automatic digester system.

The completely digested wastes will then pass through a centrifugal separator which will produce a liquid effluent suitable for use directly as a plant nutrient in the hydroponic beds. The separated digester solids will be recirculated through the digesters

and eventually again removed by the separator. These solids will be incinerated to convert them into minerals usable in plant and animal nutrients, and carbon dioxide for use by plants, including the algae system. The waste gases produced by the digesters, chiefly methane and carbon dioxide, can be converted to carbon dioxide and water vapor in a suitable automatic combustion unit.

Hydroponics

Hydroponics as applied to the simulator ecology is the growth of food plants in nutrient solutions. Since plants utilize only nutrients in solution, soil acting as a physical support and store of soluble elements, the soil may be dispensed with. Seeds will be germinated on a layer of inert fibrous material wetted by a nutrient solution. As roots develop, they penetrate the support and become immersed directly in the solution below the support layer. Germination may be hastened by a plastic sheet covering the seedbed, retaining humidity therein. At germination, this cover is removed to permit growth, the support bed being raised above the solution as true roots develop to allow required root aeration.

The nutrient solution will be stored in tanks at the mechanical equipment level, and pumped to the hydroponic trays as necessary. A return system will enable replenishment of nutrients either batchwise or on a continual recirculation basis. The liquid loss of solution due to transpiration, etc. by the plants will be made up from treated waste effluent storage.

Plants will be used in two ways: directly as food by the crew,

~~and indirectly as feed for the food animals. Plant material trimmed~~
~~separated digester solids will be recirculated through the digesters~~

in food preparation, as well as "feed" type plants, will be used

as animal feed. Conversely, butchering wastes will be digested for

utilization as plant nutrient in the hydroponic solution.

The use of a single all-purpose hydroponic solution is planned,

since maintenance of a variety would increase the requirements for

control testing and treatment, both manual and automatic. Thus,

one criterion in the selection of plant types will be their ability

to function in a common nutrient.