LUNAR ECOSYSTEM AND ARCHITECTURAL PROTOTYPE (PROJECT LEAP), S.W. Ximenes, F.J. Winisdoerffer, J.D. Brown, Sasakawa International Center for Space Architecture, University of Houston

The University of Houston's Sasakawa International Center for Space Architecture is pursuing research and design studies for permanent lunar settlements. One such study, Project LEAP (which stands for Lunar Ecosytem and Architectural Prototype) has produced staged growth concepts for a habitat to support lunar mining operations. The project has been undertaken in co-operation with the Advanced Programs Office and the Solar System Exploration Division at the NASA-Johnson Space Center.

The principal purpose assumed for the development is to produce liquid oxygen and hydrogen propellant for an Advanced Space Transportation System and future orbital infrastructure consumption. The base has been designed to grow over a ten year period from an initial six-person crew occupancy to an advanced facility capable of accommodating as many as one hundred and fifty people. Evolutionary growth stages would rely increasingly upon acquisition, processing and utilization of lunar materials to optimize self-sufficiency. Achieving large volumes of habitable space within a relatively short period of time, and with minimum requirements for construction processes is a major objective in the overall growth plan of the core facility. This is accomplished in part by a planned deployment of three basic module components which determine the eventual layout of the facility. These three components, the common module, the interconnect node, and the airlock are delivered to the lunar surface according to a growth scenario dictated by increased personnel needs and operational readiness of base functions. Due to the hexagonal design of the interconnect node a "circle the wagons" approach allows the common modules to form perimeters of floor space which can then be enclosed with inflatable domes. The resulting geometry develops a honeycomb pattern of volumetric growth that evolves in stages to produce dedicated areas for habitation, laboratories, and farming/life-support functions.

Project LEAP's study objectives have sought to identify incremental site development and facility requirements; identify candidate site development and construction options; propose site layout and habitat design/growth concepts; and survey requirements to achieve a high level of self-sufficiency. As an ongoing research and development program, the project has evolved from research and data collection for concept and design to the production of 3-d solids computer modeling. A 1/30th scale architectural model of a representative lunar base site has been constructed depicting facilities for habitation, mining, transportation, power, communications, refining, and storage.