AN ENGINEERING AND COST MODEL FOR HUMAN SPACE SETTLEMENT ARCHITECTURES: FOCUS ON SPACE HOTELS AND MOON/MARS EXPLORATION. C. M. Reynerson, Ball Aerospace and Technologies Corp., P.O. Box 1062, Boulder CO 80306-1062, USA (creyners@ball.com).

This paper addresses a concept-level model that produces technical design parameters and economic feasibility information addressing future inhabited Earth-orbiting and Moon/Mars Exploration platforms. In this context, the Mars exploration platforms considered include those currently chosen in the NASA Mars Design Reference Mission. Space hotels will also be examined.

This paper uses a design methodology and analytical tools to create feasible concept design information for these space platforms. The design tool has been validated against a number of actual facility designs, and appropriate modal variables are adjusted to ensure that statistical approximations are valid for subsequent analyses. The tool is then employed in the examination of the impact of various payloads on the power, size (volume), and mass of the platform proposed.

The development of the analytical tool employed an approach that accommodated possible payloads characterized as simplified parameters such as power, weight, volume, crew size, and endurance. In creating the approach, basic principles are employed and combined with parametric estimates as necessary. Key system parameters are identified in conjunction with overall system design. Typical ranges for these key parameters are provided based on empirical data extracted from actual human spaceflight systems.

In order to provide a credible basis for a valid engineering model, an extensive survey of existing manned space platforms was conducted. This survey yielded key engineering specifications that were incorporated in the engineering model. Data from this survey is also used to create parametric equations and graphical representations in order to establish a realistic range of engineering quantities used in the design of manned space platforms.

Using this tool sample space hotels and Moon/Mars exploration architectures are examined and compared with emphasis on cost minimization through variance of key mission requirements. This paper is based on work Dr. Reynerson recently completed at George Washington University in fulfillment for the degree of Doctor of Science in Astronautics.