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Author: Dr. Marc Cohen
United States

ECLSS-FIRST SPACE HABITAT ARCHITECTURE

Abstract

The conventional approach to designing space habitats imposes substantial inefficiencies upon the Environmental Control and Life Support System (ECLSS). The design and dimensions of these accommodation spaces are often completely arbitrary in relation to the optimal form, configuration, location, and size of the ECLSS elements. The limited availability of rack- or compartment-based accommodation space forces the ECLSS distribution to spread out suboptimally among multiple modules, or, to centralize into a single rack. Compelling this complex equipment to squeeze into a priori sized rack volumes makes system design and operations much more difficult for ECLSS equipment and so adds to increased failure rates. This "bash to fit, paint to match" philosophy leads invariably to profound dysfunctionalities in the design, distribution, engineering, and installation of crucial life support elements. The underlying "Don't size the box/fit the box" doctrine leads to serious difficulties in cleaning, maintaining, and servicing the ECLSS equipment. This paper argues that the design of the ECLSS takes precedence over all the other systems and subsystems.