

SPACE SYSTEMS SYMPOSIUM (D1)  
Innovative and Visionary Space Systems Concepts (1)

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BALANCE OF MATERIAL FLUXES WITHIN A CLOSED-LOOP HABITATION SYSTEM

**Abstract**

An effective and self-sustainable artificial habitat design is essential for human spaceflight and expansion of mankind into orbit or towards other celestial bodies. To successfully establish a future habitat, it is imperative to reach a high degree of self-reliance and sustainability. Various products like higher plants (e.g. vegetables, fruits, crops), animal husbandry (e.g. fishery, insects), fuel gases (e.g. Hydrogen, Oxygen), building materials (e.g. structural and isolation materials), but also consumables (e.g. clothes) as well as base maintaining services (e.g. water or waste recycling) and power supply will be provided and where applicable recycled in such a system.

To draft an initial system concept of a terrestrial Facility of Laboratories for Sustainable Habitation (FLaSH) a habitat design workshop has been held in DLR's Concurrent Engineering Facility (CEF) at the Institute of Space Systems. The closed loop approach for a habitat is the most critical issue causing a complex interrelation between the overall system and the components design. Therefore tracking the balance of material fluxes by the help of a material trade matrix has been one focus of the system domain during the FLASH study. In this paper it is described how the matrix has been used to adjust material fluxes in a consistent manner by adding up the individual fluxes of each domain into a complete sum. Furthermore the process of communicating necessary design changes during the study based on the matrix like on a stock exchange floor is elaborated.