Paper ID: 25359
student

SPACE LIFE SCIENCES SYMPOSIUM (A1)
Poster Session (P)

Author: Mr. Dan Fries
University of Stuttgart, Germany

Mr. Stefan Fuggmann
Germany

DESIGNING AN ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEM (ECLSS) FOR AN INTERPLANETARY MANNED MISSION EMPLOYING SHORT-TERM AVAILABLE TECHNOLOGY

Abstract

In the context of the Mars Society International Student Design Competition it is attempted to find the most efficient way of keeping two persons in a spaceship alive during a long term mission to Mars without subjecting them to unbearable hardship. The proposed ECLSS provides the crew with vital needs like atmosphere, food, water, but also takes into consideration hygiene, clothing and synergies with other subsystems. Furthermore, waste processing and storage is guaranteed. When choosing the concept, the first priority is the feasibility of implementing the system by 2018 after all necessary tests have been conducted. This already reduces the possibilities greatly. This also implies choosing as little low-technology-readiness-level technology as possible while keeping reliability high and equivalent system mass at a minimum. This leads to an almost completely closed system, which recycles as much gas and fluid as possible. Synergies between the ECLSS and other systems increase the recycling rate even further, such as using waste gas for the attitude and orbit control system. The ECLSS has to be tested at least one lifetime upon launch, thus reducing the time window for development of advanced technologies, detailed design and building of the system greatly. It was found that with short-term available technology an interplanetary manned transit mission is very difficult to achieve and many promising technologies have not been advanced in recent years. To proof the systems viability it has been simulated with the software tool ELISSA. The proposed ECLSS is the best tradeoff between reduced system mass, minimal risk and cost, reliability and crew comfort.