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Life Support and EVA Systems (6)

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REGENERATION OF WATER AND ATMOSPHERE AN SPACE STATION: THE EXPERIENCE
GAINED ON THE SPACE STATIONS "SALUT", "MIR", ISS AND DEVELOPMENT PROSPECTS

Abstract

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Implementation of promising orbital and interplanetary missions is associated with improvements in crew life support systems (LSS). One of the LSS key components are water and atmosphere supply systems. The systems should provide maximum recovery of water and oxygen from products of life and from bioengineering systems meeting the needs of the crew in water and oxygen with minimum consumption from supplies. In the paper LSS based on physical/chemical means are reviewed. Recovering degree of products of life is discussed on a base of a balance of recovered water using for consumption, oxygen generation and other needs. Experience in the design and operation of LSS of "Salut", "Mir" and ISS space stations based on water recovery from humidity condensate and from urine, oxygen generation by electrolysis, air purification from carbon dioxide and micro impurities as well as the use of supplies delivered made it possible to obtain the data on human water and gas balance on the space station and the operation parameters of the recovery systems. The data are used to perform design analysis life support systems for promising space stations. Water recovery from humidity condensate at ISS allows 40% Experience in development and operation of water and atmosphere recovery systems shows that process and hardware improvements make it possible to reduce 2 to 3 times the spare capacity per kg of water recovered. Consumption of energy of the water recovery systems will be also acceptable for long period autonomic space missions. A physical/chemical integrated system for regenerative life support on an perspective station based on the propositions laid down in the paper is reviewed.

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