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Strategies & Architectures as the Framework for Future Building Blocks in Space Exploration and Development (1)

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CONCEPTS OF SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT IN THE CONTEXT OF HUMAN SPACE EXPLORATION

Abstract

The future of human spaceflight has various scenarios on the horizon, e.g. lunar missions and Mars missions, with different stakeholders, e.g. private commercial and institutional. Various mission scenarios also include in-situ resource utilization to allow long-term missions, making these scenarios sustainable. Sustainability and sustainable development are concepts, which have been formulated and elaborated in the past decades for application on Earth. In addition, these terms have migrated into other, more specified areas, including space flight. This paper provides a systematic review of the concept sustainable development in relation to spaceflight and discusses variants of the concept, based on their respective perspectives, e.g. from Earth to space, where technology and resources are used to sustain a space mission. It is discussed how the concept of sustainable development has manifested in a spaceflight context, how it evolved, e.g. from the Outer Space Treaty to NASA's concept of planetary sustainability and what the different viewpoints imply. Furthermore, in-situ space sustainable development is defined and discussed, elaborating how this concept is required and should be implemented to allow sustainable missions in a long-term.