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ADVANCE MANUFACTURED SPACE MICRO HABITAT: TOWARDS AFFORDABLE, ADAPTABLE AND SUSTAINABLE SPACE HARDWARE

Abstract

This paper presents part of the conclusions achieved after a thorough investigation conducted by the author in the state-of-the-art advance construction, manufacturing and design techniques applicable to the next generation of space hardware and habitats. The objective of this research has been to analyze available tools and techniques even with low technology readiness levels (TRL) and to develop several strategies and methodologies for their combinations and synergy. Technical information from researchers, innovation centers, commercial solutions as well as bibliography on the matter from space and other industrial sectors has been combined with first hand experiences and achievements. While this paper shows some of the engineering and architectural major technical points for the use of such tools and their combinations it will also applied some of them to the constructive design challenge of developing more affordable, adaptable and sustainable space habitats. For this, those techniques and synergies will be studied on the different manufacturing and design stages of the hardware development using a small-scale complementary technical habitat for deep space missions as a test project. Therefore the design, construction and functional cycle it is analyzed from the point of view of the techniques and their nature as well as some of the materials related to it. However this study goes beyond the applications to manned habitats and also paves the way to the development of new constructive design robotic processes for advance space hardware. The next generation of space constructions either in LEO, GEO or on other planetary surfaces requires advance design process in order to work the affordability, adaptability and sustainability from the conception process to the manufacturing and deployment stage. Construction and design are directly connected for this matter and presented from both analytical and designing approaches with many potential later applications in complex engineering and architectural construction projects in Space and on Earth.