

23rd SYMPOSIUM ON SPACE ACTIVITY AND SOCIETY (E5)
Human Habitation Beyond Low Earth Orbit (3)

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ADVANCE SPACE ARCHITECTURAL DESIGN: REQUIREMENTS, CONSTRAINS AND
CONSEQUENCES TO APPLY ADVANCE DIGITAL ROBOTIC MANUFACTURING AND BUILDING
TECHNIQUES

Abstract

The following paper puts together the applied research conducted by both authors related to use of innovative advance digital manufacturing and construction techniques for the development of architecture projects and product designs both for space as well as for advance industrial sectors on Earth. Looking for better and more efficient ways to implement medium scale hardware both in other planetary surfaces (including Earth) as well as in LEO and GEO, this research is focused in the influence of those techniques over the design process and vice versa. Therefore, a thorough study of the state-of-the-art digital and robotic manufacturing, construction and design tools/techniques, including additive, subtractive, hybrid, in situ and building information models (BIM) techniques, leads to the analysis of requirements, constraints, drawbacks and gaps between the implementation and the design processes. Beyond this point this research also points out some of the connections and synergies between Space and Earth architectural and object manufacturing problems, using the small scale as its reference. The use of new techniques also influences the type and process of design that the space sector has known till now. The way we implement and build space hardware is becoming one of the strongest pillars for the next generation of complex systems such as habitats, and any attempt to master this new and innovative field implies the study of methodologies, consequences and relations based a broad and deep knowledge of them. Therefore, within the relation between tools and objects this paper shows some of the conclusions that lead author's current developments and a relation matrix showing consequences and first conclusion of the integration on new design and techniques in the space architectural design field. Rather than final solutions, currently under development the papers present a new way of thinking and a starting point in order to achieve more feasible, sustainable and advance space hardware and habitats with many more potential application uses on Earth as a continuum.