

SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND
DEVELOPMENT (D3)

Systems and Infrastructures to Implement Future Building Blocks in Space Exploration and Development
(2)

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AN EFFICIENT BIONIC-BASED STRATEGY FOR SPACE STATIONS MANUFACTURING &
ASSEMBLY PROCESS

Abstract

Cost and complexities associated with gradual development of space-based structures, similar to that of International Space Station (ISS) have been studied and a new efficient strategy is proposed based on Bionics in general and plant growth behavior in specific. The proposed design and manufacturing process aims to be both efficient and cost effective. It also observes the very fact that any space station must be suitably accommodated and inhabitable throughout its construction period. In this work, Bionics' principles have been effectively used to propose a systematic and efficient solution to form space structures in a modularity manageable process. The proposed approach is similar to how a typical DNA is configured in different natural species. In this regard, we have effectively studied fast-growing plants to investigate modular building blocks suitable for development of massive structures in space. The proposed method is expected to be efficient, especially for the low-earth orbital hotels and space-based factories. Extensive case-studies also show that the new approach could effectively help manage the number of space-missions needed for the erection process. In fact, we show that our method, while in use, could have lowered the number of flights to build ISS as many as %40. Furthermore, the method could clearly serve as an effective systematic guideline to design and build new space shuttles cargo-bays.