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ARCHITECTURE AND SPACE SYSTEMS DESIGN OF MARINA: AN ORBITAL SPACE HOTEL

Abstract

Fifty years after the first moon landing, there has been a fundamental shift in the space industry from short-term pioneering expeditions to planning for long-term exploration and colonization, in addition to novel commercial ventures such as space tourism. As a result, architects and engineers are involved in new design challenges for envisioning long-term habitable systems in space, both in orbit and on planetary surfaces. Our MAnaged, Reconfigurable, In-space Nodal Assembly (MARINA) is an award-winning concept at the NASA-sponsored RASC-AL 2017 competition for a commercially owned and operated space station with a luxury hotel as the anchor tenant, that will be a successor of the International Space Station, which is planned to be decommissioned by 2028. Realizing such a space station will require an interdisciplinary approach spanning space systems engineering, architecture, design, business and finance, psychology and art. Key features of MARINA include a modular design enabling incremental build-up of habitable volume and subsystem capabilities, standardized interfaces throughout the station to facilitate the exchange of materials and services between tenants, responsive design solutions for humans, and several options for ready-built customer modules allowing customers to forego the costly and lengthy space system design process. Accordingly, we have used new computational form-finding and structural optimization strategies which rely on advanced robotic fabrication technologies in order to realize an in-space luxury "yacht marina" for tourists that can creatively support future human habitation in Low Earth Orbit.

The central feature of MARINA is a space hotel which caters to the burgeoning space tourism market. Both the hotel common areas and private rooms have windows enabling a unique view of the Earth from above. The interiors have been equipped with a shape changing interactive system that will engage with users in generating a multi-functional space experience inside each module.

This work contributes to a new field of space architecture where habitable spaces should be consistent with the constraints of both the space environment and commercial viability, while envisioning new ways of living, experiencing microgravity and overlooking the Earth.