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BUBBLE ONE – SCALABLE SHIRT SLEEVE SPACE CONSTRUCTION SYSTEM UTILIZING INFLATABLE MOLDS AND SPACE RESOURCES

Abstract

The purpose of this paper is to further develop the concept for 'Bubble One' a new proposal for a habitat that combines terrestrial pressurized balloon "build from the outside in" spray concrete construction with in situ resources, adapted to large scale construction in Free Space, to produce massive, nearly seamless, radiation-resistant space buildings that are structurally solid and designed to last.

Large volume in-space habitats must provide radiation shielding and structural integrity while rotating to provide spin induced "gravity." Such habitats must also be provided with energy and light, and a method for dispersing exhaust heat. Also important is the need for simple materials, and minimizing expensive EVAs for space suited labourers while not going overboard in the use of robots that are unable to negotiate the challenges encountered in an early-stage worksite.

Bubble One consists of a pressurized balloon form with custom airlocks at each end, sprayed on the inside with varying layers and types of materials and strengthening members such as rebar. As the layers progress, wiring, plumbing and other elements are laid in, leading to the final installation of the fixtures needed for inhabitants. Bubble One's supply and labour train includes hab modules for workers, supply trucks for hardware, air tankers, and "astrokrete" cement trucks with robotic sprayer systems.

The solar collection and heat dispersion modules are built in a second pressurized sphere that is sliced at the equator when completed, resulting in a concave reflectorized solar collecting module and a heavily plumbed and vaned concave heat exchange module. Both are attachable to the main module at its polar air locks, the solar collector sunward and the cooling module outwards in total shade. The solar collector provides smelter level heat at its focal point, and sunlight to be transmitted via light pipes into the central sphere. Docking is via an extension at the shadowed pole, allowing payloads to be floated in and out, even as the habitat is in rotation.

Bubble One minimizes terrestrial materials. The majority of its mass is "astrokrete" (the tailings of asteroid mining, or lunar supplied regolith) with glass and some iron or metallic strengthening members. Using robotics, the human workforce is leveraged, but not replaced, as detail work and form and fit in early models will require a human touch. After all, the point is for humans to live – and work – in space.