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REDESIGN OF SALYUT STATION FOR DUAL-USE OF RESEARCH AND TOURISM

Abstract

As the time of the ISS is gradually coming to an end, it is becoming a promising time for new commercial space stations.

This study reexamined the historic Salyut station and redesigned it as a multipurpose reusable space station. Originally designed by the Soviet Union for international reconnaissance in the 1970s, it is now under the name "Almaz" and owned by the private company, Excalibur Almaz. In order to provide efficient access to space, hence commercialization, the design aims to serve two uses: research and tourism. With two highly opposing users and functions, the design has to support the requirements of both. Other constraints include pre-determined structure and most importantly, a limited volume to accommodate a maximum of six users. A series of volume studies uncovered specific target problems and subsequently led to strategies over space optimization.

Constraints of the original station geometry guided design decision making. Based on environmental psychology research, the design adopts evidence-based biophilic design principles to improve mental health, wellbeing and therefore crew performance. The final outcome from the research is the integration of flexible features, which can transform the station for various scenarios, adapting to both user groups, thereby breaking the monotony of the small volume. The use of deployable and multipurpose surfaces increase the flexibility of the interior volume.

A phased approach of this design entails a luxury experience crafted for space tourists, with help of augmented and virtual reality environments. These mixed realities will be projected onto an attached small inflatable module (e.g. Bigelow Expandable Activity Module (BEAM)) where a simulated immersive environment takes place.

In summary, the paper provides an exploration of the design solution for a reusable multi-functional space station that is driven towards being human-centered from both operational as well as psychological perspectives, while catering to other important factors such as the station geometry and mass limitations.