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THE REMNANT PROJECT: BUILDING A SELF-SUSTAINABLE LUNAR HABITAT FOR LONG-TERM HUMAN MISSIONS TO THE MOON

Abstract

Humanity has constantly looked at the sky, and glanced at our Moon. However, this can be much more than just a sight. Since the Apollo missions proved that our natural satellite was conquerable, it has come the time when looking up at our Moon is simply not enough.

In December 2017, United States president, Donald Trump, signed the Space Policy Directive-1 which refocused NASA's mission to return to the Moon, with the goal of eventually going to Mars and beyond. Additionally, many international and commercial entities are focused on establishing lunar infrastructure that increases the capabilities to perform science and exploration missions beyond LEO. Among these entities, Instarz, LLC was founded to pave the way for self-sustainable habitats in space, significantly reducing the costs of the mission. The Remnant project was started to provide the necessary infrastructure to such entities interested in going to the Moon and establishing a permanent human presence that will ultimately lay the foundation for future missions to Mars. The project's mission is to establish a low cost, reliable and safe habitat on the lunar surface by the mid to late 2020s. This habitat, called Remnant, is composed of a cylindrical aluminum module, similar to the modules on the ISS. However, a radical new approach has been adapted to this design, after being settled on the Moon, this module will separate in half via the use of a Marman clamp and a mobility system to deploy an inflatable ellipsoid dome. This method substantially increases the total pressurized volume to approximately 1,000 m3. From this result, it is acquired that a total of 8 crew members can live and work on the habitat for long-duration missions of up to 12 months. To provide MMOD and radiation shielding, a Whipple Shield is installed on the module and the inflatable is made of strong fabrics. Once on the Moon, the habitat can be covered with lunar regolith to increase its protection levels and maintain a 50 mSv/yr radiation dosage. To minimize cargo resupplies the habitat must be as self-sustainable as possible, that's why this habitat includes innovative agricultural techniques and advanced life support systems. This project, which started in March 2018, is currently in its Phase A and it's scheduled to reach the SRR and SDR milestones this summer. A series of small scale prototypes and mockups will follow to serve as proof-of-concepts for the mission.