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UTILIZATION OF PREFABRICATED MODULAR PROFILE CONSTRUCTION AS SURFACE ASSETS SHIELDING TECHNIQUE IN THE LUNAR ENVIRONMENT

Abstract

In recent years, countries and companies alike have gained an increased interest in lunar exploration. Exemplified by the Artemis, Commercial Lunar Payload Services (CLPS), and international missions, the need for a sustainable lunar infrastructure is steadily growing. Starting with landers and rovers, the decade's upcoming missions also include human exploration both on foot and with the help Pressurized and unpressurized rovers. Sustaining this development necessitates adequate protection for long-lasting systems . The proposed innovation consists in a system of erectable structures erectable structure made with heritage Sprung design and building principles that will provide protection from the lunar environment for inner habitats or mobility platforms (rovers, terrain vehicles, etc.). This prefabricated, modular shielding infrastructure protect any asset hosted inside it from dust intrusion, micrometeoroids, plume ejecta, extreme temperature variations, high vacuum, cosmic rays and other high-energy ionized particles, plasma, solar ultraviolet (UV) and other electromagnetic (EM) ionizing radiation, static electricity charging, changing gravitational conditions, and other electrically induced effects. Erected Through the use of surface autonomous robotics on the surface, it will employ a building "kit" of pre-manufactured pieces including a lightweight structure and a fabric membrane paneling utilizing Proven Sprung construction methodology, reinforced with a new membrane developed through RD aimed to the development of a new lunar-compatible sealing material. This paper presents a concept of a scalable lunar infrastructure built using this technology to enable an incremental sustainable human presence on the surface. It includes a description of the concept, the construction process, and a technological roadmap for the development from a ground construction technique to an interplanetary construction framework.