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LUNAR HABITAT

Abstract

As a stepping stone to demonstrate technologies for Mars or as an end in itself, the Moon is the next target of numerous missions in upcoming decades. Even though robots will be the first to come back to our natural satellite, humans will likely follow soon after. The Lunar Orbital Platform - Gateway (LOPG-G) is just one of the many ambitions towards a human presence in the lunar vicinity. The production of propellant using the resources directly available on the surface (In Situ Resources Utilisation - ISRU) has also been extensively under study, even industries try to close a business case on the subject. The presence of human is only a question of time, but it requires special infrastructures in order to be sustainable over an extended period. This study proposes a conceptual design of habitat, capable of welcoming 4 crewmembers over a duration of 4 weeks, every 6 month. This mission plan is suitable for maintenance of tele operated systems on the Moon and to perform experiments on deep space technologies. The Habitat is made of two modules, the main one is a 5m diameter rigid cylinder inspired by the ISS modules architecture. It will accommodate the hardware requiring pipes and complex electric systems such as the science segment where the crew will be able to test breakthrough technologies and to make scientific experiment. Both ends of the rigid cylinder offer an interface, the rover can be docked to an expandable port while EVA would be performed via the dual suitport on the opposing side. The second module is inflatable and is jutting from the side. With approximately 16m2 in a semi-ellipsoid shape, it will host the living area, the private quarters and the dining space. A 3D-printed regolith shield will be printed over the two modules, providing protection against micrometeorites, radiations and harsh temperature, leaving only both sides of the cylinder clear. During the day, the 11kW of average power consumption will be supplied by flexible vertical solar arrays named Solar Banners. The lunar night on the South Pole is only 3 or 4 days short, a hibernation mode allows to minimize the consumption of crewed mission and rely only on H2 O2 fuel cells. The tanks of gas and water are spread along the ceiling of the habitat to provide additional radiation protection.