Paper ID: 50539
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IAF SPACE SYSTEMS SYMPOSIUM (D1)
Innovative and Visionary Space Systems (1)

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A VENUSIAN SERVICE DOCK

Abstract

This paper explores the human-centered architectural opportunities present within the Venusian atmosphere to return public attention back to space travel by emphasizing the value of having a human present on the frontier. Parking a maintenance station above the cloud deck of Venus provides an environment that normalizes certain aspects of extraterrestrial activities by increasing pressure and stabilizing temperatures. The majority of current programs and projects dictates a pressure vessel and considerable amounts of gear to provide habitable volume for people both inside and out of their craft or habitat because the missions objectives reside in near or perfect vacuum. In the Venusian atmosphere, crew will be able to live inside of their lifting envelope, and are able to go outside without the aid of a pressure suit. A manned maintenance station suspended on the Venusian cloud deck is the location for humanity's first step into the solar system beyond cis-lunar space. The planet provides many intriguing challenges; while initially very hostile, the atmosphere conceals a veritable oasis for human activity relative to anywhere within striking distance from Earth. The planet's surface is inhospitable; at temperatures exceeding 450 C and a 96.5% CO2 atmosphere at 93 bar, any surface operations will have to be extremely resilient. The winds circle the planet in 4 days, reaching speeds of up to 360 km/h at the target altitude and these winds will scour the surface of the habitat with sulfuric acid. Probes in this environment have only lasted two days, while landers have lasted a maximum of 117 minutes. A current proposal, Venera-D, has plans to survive for 24 hours on the surface. This is a significant amount of effort for minutes or hours' worth of science, and is the impetus for putting a manned maintenance station in the clouds. This station will dramatically increase the length and thereby, the effectiveness of most research missions. Creating an option to return to a servicing dock, probes and drones can conduct sorties to varying layers of the atmosphere, powered by the sun for above cloud deck operations and by battery, methane rockets, or nuclear-jet engines for deep dives to skim the surface. After each sortie, a crew can service the drones and send them back out on duty. The nuances of the Venusian environment combine to create a particularly human-centric mission architecture where the integral human component drives the purpose of the mission.