SYMPOSIUM ON TECHNOLOGICAL REQUIREMENTS FOR FUTURE SPACE ASTRONOMY AND SOLAR-SYSTEM SCIENCE MISSIONS (A7)
Technology Needs (Part 2) (2)

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MISSION ARCHITECTURES AND PLATFORM OPTIONS FOR IN SITU EXPLORATION OF THE MIDDLE ATMOSPHERE OF VENUS

Abstract

Despite numerous short duration descent probe missions, the cloud layers of Venus are still poorly understood. Exploration of these cloud layers should not pose any fundamental technology problem, since the ambient temperatures and pressures are comparable to that found near the Earth's surface. Nevertheless, the possible use of long endurance aerial platforms to perform essential in-situ science in and above the cloud layers, presents a number of technology challenges that would need to be addressed in the preparatory phase of any future Venus atmosphere mission. Furthermore, a plethora of different platform options and overall mission architecture options still requires careful comparison. For example, one promising platform option is a fold-out solar-photovoltaic powered aircraft that would be deployed from a parachute-braked descent probe. In order to transmit data from such an aerial platform directly to Earth, it would be necessary to accurately point and hold a directional antenna on the appropriate vector. One viable scheme to acquire this vector, is to establish a two-way link using an Earth-based beacon and a phased-array on the platform. Alternatively, it may be more effective to employ a small orbital data relay satellite, to permit much reduced platform transmission power using a non-directional antenna. Whilst such an aerial platform would benefit from a relatively high solar radiation flux, it is likely that on-board power would still be limited, hence any attempts to partially counter the high-speed zonal winds near the equator would require an efficient propulsion-power system. This paper aims to set-out some of the main architecture and platform options and their associated challenges in order to inform an appropriate technology development program.