

EDWARD HODGSON, Hamilton Sundstrand Space Systems International, Inc. A Chameleon Suit to Liberate Human Exploration of Space Environments

The direct operations of humans in space environments must become commonplace if the goals of the HEDS (Human Exploration and Development of Space) Enterprise are to be achieved. This transition from rare and expensive Extra Vehicular Activity (EVA) to normal and expected "going outside" can be enabled by a system concept in which the walls of the protective clothing work with the space environment to provide required life-support functions. This will liberate future space workers and explorers from reliance on cumbersome mechanisms and consumable resources currently used for life-support. It will be achieved by providing the ability to tune the heat transmission characteristics of the outer garment and by incorporating other life-support functions in the suit wall.



Maximum radiated heat load from combined PLSS and pressurized suit area.

This will allow heat flow from the body to be modulated to match varying metabolic activity levels in any environment, and use of the body's surface area to optimize EVA life-support processes. As a result, the system can be made lighter, more robust and less reliant on consumable resources. This study is proposed to evaluate the broader implications of the "Chameleon Suit" system concept studied under our Phase I program. Our Phase I study showed the benefits and feasibility of applying emerging technologies to enable heat rejection from the suit

surface. Under Phase II, we will study the logical extension of this concept to revolutionize all aspects of EVA life-support. By applying emerging technology for microelectronics, active polymers and biomimetic chemical processes, we will seek to substantially eliminate the bulky life-support backpack that dominates current EVA systems and truly liberate human explorers for future NASA missions.



EVA is the essential element for real human space exploration.