

Suitport Feasibility - Development and Test of a Suitport and Space Suit for Human Pressurized Space Suit Donning Tests

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The suitport concept has been recently implemented as part of the small pressurized lunar rover (Currently the Space Exploration vehicle, or SEV) and the Multi-Mission Space Exploration Vehicle (MMSEV) concept demonstrator vehicle. Suitport replaces or augments the traditional airlock function of a spacecraft by providing a bulkhead opening, capture mechanism, and sealing system to allow ingress and egress of a spacesuit while the spacesuit remains outside of the pressurized volume of the spacecraft. This presents significant new opportunities to EVA exploration in both microgravity and surface environments. The suitport concept will enable three main improvements in EVA by providing reductions in: pre-EVA time from hours to less than thirty minutes; airlock consumables; contamination returned to the cabin with the EVA crewmember. To date, the first generation suitport has been tested with mockup suits on the rover cabins and pressurized on a bench top engineering unit. The work on the rover cabin has helped define the operational concepts and timelines, and has demonstrated the potential of suitport to save significant amounts of crew time before and after EVAs. The work with the engineering unit has successfully demonstrated the pressurizable seal concept including the ability to seal after the introduction and removal of contamination to the sealing surfaces. Using this experience, a second generation suitport was designed. This second generation suitport has been tested with a spacesuit prototype using the pressure differentials of the spacecraft. This test will be performed using the JSC B32 Chamber B, a human rated vacuum chamber. This test will include human rated suitports, the suitport compatible prototype suit, and chamber modifications. This test will bring these three elements together in the first ever pressurized donning of a rear entry suit through a suitport. This paper presents design of a human rated second generation suitport, modifications to the JSC human rated chamber B to accept a suitport, and a compatible space suit to support pressurized human donning of the pressurized suit through a suitport. Design challenges and solutions and compromises required to develop the system are presented. Initial human testing results are presented.

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