

Mechanical Counter-Pressure EVA Suits: NASA Outlook and Development Strategy

Since the 1950s, mechanical counter-pressure (MCP) has been investigated as a possible alternative architecture to traditional extra-vehicular activity (EVA) suits. While traditional gas-pressurized EVA suits provide physiological protection against the ambient vacuum environment by means of pressurized oxygen to at least 3.1 psid, MCP provides protection by direct application of pressure on the skin by a fabric. In reviewing the concept, MCP offers distinct potential advantages to traditional EVA suits: lower mass, reduced consumables, increased mobility, increased comfort, less complexity, and improved failure modes. In addition, as basic feasibility was established in the 1960s with the successful testing of the Space Activity Suit, MCP seems poised to inevitably supplant traditional EVA architectures with a modest degree of concentrated development. However, as they say, “The devil is in the details”. This paper serves as a comprehensive summary of the technical work that has been completed related to MCP from 1960 to 2019, the technical gaps that need to be closed to facilitate a flight-capable design, and outlines an overall development strategy that NASA feels would best address these gaps moving forward.