

SPACE OPERATIONS SYMPOSIUM (B6)
Human Spaceflight Operations Concepts (1)

Author: Mr. Matthew Gast
United Space Alliance, United States, matthew.gast-1@nasa.gov

UTILIZATION OF ISS TO DEVELOP AND TEST OPERATIONAL CONCEPTS AND HARDWARE
FOR LOW-GRAVITY TERRESTRIAL EVA

Abstract

NASA has considerable experience in two areas of Extravehicular Activities (EVA). The first can be defined as microgravity, orbital EVAs. This consists of everything done in low Earth orbit (LEO), from the early, proof of concept EVAs conducted during the Gemini program of the 1960s, to the complex International Space Station (ISS) assembly tasks of the first decade of the 21st century. The second area of expertise is comprised of those EVAs conducted on the lunar surface, under a gravitational force one-sixth that of Earth. This EVA expertise encapsulates two extremes – microgravity and Earthlike gravitation – but is insufficient as humans expand their exploration purview, most notably with respect to spacewalks conducted on very low-gravity bodies, such as near-Earth objects (NEO) and the moons of Mars. The operational and technical challenges of this category of EVA have yet to be significantly examined, and as such, only a small number of operational concepts have been proposed thus far. To ensure mission success, however, EVA techniques must be developed and vetted to allow the selection of operational concepts that can be utilized across an assortment of destinations whose physical characteristics vary. This paper examines the utilization of ISS-based EVAs to test operational concepts and hardware in preparation for a low-gravity terrestrial EVA. While the ISS cannot mimic some of the fundamental challenges of a low-gravity terrestrial EVA – such as rotation rate and surface composition – it may be the most effective test bed available.

Copyright © 2010 by United Space Alliance, LLC.