EVALUATION OF DUAL PRESSURIZED ROVER OPERATIONS DURING SIMULATED PLANETARY SURFACE EXPLORATION

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Introduction: A pair of small pressurized rovers (Space Exploration Vehicles, or SEVs) is at the center of the Global Point-of-Departure architecture for future human planetary exploration. Simultaneous operation of multiple crewed surface assets should maximize productive crew time, minimize overhead, and preserve contingency return paths. **Methods:** A 14-day mission simulation was conducted in the Arizona desert as part of NASA's 2010 Desert Research and Technology Studies (DRATS). The simulation involved two SEV concept vehicles performing geological exploration under varied operational modes affecting both the extent to which the SEVs must maintain real-time communications with mission control ("Continuous" vs. "Twice-a-Day") and their proximity to each other ("Lead-and-Follow" vs. "Divide-and-Conquer"). As part of a minimalist lunar architecture, no communications relay satellites were assumed. Two-person crews consisting of an astronaut and a field geologist operated each SEV, day and night, throughout the entire 14-day mission, only leaving via the suit ports to perform simulated extravehicular activities. Standard metrics enabled quantification of the habitability and usability of all aspects of the SEV concept vehicles throughout the mission, as well as comparison of the extent to which the operating modes affected crew productivity and performance. Practically significant differences in the relevant metrics were prospectively defined for the testing of all hypotheses. **Results and Discussion:** Data showed a significant 14% increase in available science time (AST) during Lead-and-Follow mode compared with Divide-and-Conquer, primarily because of the minimal overhead required to maintain communications during Lead-and-Follow. In Lead-and-Follow mode, there was a non-significant 2% increase in AST during Twice-a-Day vs. Continuous communications. Situational awareness of the other vehicle's location, activities, and contingency return constraints were enhanced during Lead-and-Follow and Twice-a-Day communications modes due to line-of-sight and direct SEV-to-SEV communication. Preliminary analysis of Scientific Data Quality and Observation Quality metrics showed no significant differences between modes.