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BASALT – A Science-Based Mars Con-Ops Astronaut Field Simulation"

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BASALT (**B**iotic **A**nalog **S**cience **A**ssociated with **L**ava **T**errains: ConOps Development for Future Human Exploration of Mars) was a 5-year NASA funded (PSTARS) analog mission study that sought to develop the requirements, protocols and associated technologies for human missions on Mars with the attendant Earth based support challenges (variable time-delay and bandwidth limitations) while maximizing the science return.

BASALT was a large (~50) team comprised of scientists (geologists, chemists, astronomers and biologists) with NASA astronauts, engineers, IT specialists and Human Factors. Its goal was to plan and operated a complete end-to-end human exploration mission on the Martian surface with simulation astronauts in a realistic high-fidelity science field environment. This would occur with a communications infrastructure having a Mars base (real-time) and an Earth-based science backroom (with time-delays). Concepts of operations, traverse planning, science sample site identification, "real-time" sample assessment from field instruments and consensus scientist evaluations, common sample collection protocols suitable for geology, geochemistry and astrobiology, along with time management and software tools to operate and document all aspects during the traverses.

Field deployments of several weeks each were accomplished at the Craters of the Moon National Monument in Idaho (1) and at Hawaii Volcanos National Park in Hawaii (2). A command center was created to house the Earth science team as well as a sequestered Mars base. Voice and telemetry communications were established to allow real-time (safety) and mission-time (delays) with several simulation astronauts in the field executing prospecting traverses. Support personnel and situation awareness video accompanied the sim-astronauts.