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ABSTRACT: Planetary Basalt Construction of a Launch/Landing Pad – PISCES Project Update

Lunar Exploration Analysis Group October 20-22, 2015

EXECUTIVE OVERVIEW

To provide a briefing on the initiation and progress of a joint project between the PISCES and NASA with the goal being to: develop and demonstrate technologies associated with planetary construction using basalt.

SYNOPSIS

Recently, NASA Headquarters invited PISCES to become a strategic partner in a new project called "Additive Construction with Mobile Emplacement" (ACME). The goal of this project is to investigate technologies and methodologies for constructing facilities on the Moon, Mars and asteroids using planetary basalt material. The first phase of this project is to robotically-build a 75-ft landing pad out of basalt material on the Big Island of Hawaii. Currently, PISCES and the NASA Kennedy Space Center (KSC) have begun project planning and development for the basalt construction of a robotically-built basalt launch and landing pad following the completion of a "lunar sidewalk" construction in March. Construction is scheduled to begin in the fall 2015.

PISCES recently emplaced a 4-segment sidewalk in downtown Hilo Hawaii during March 2015. The basalt used various binding agents and forms. This "lunar sidewalk" will be evaluated over the next year for performance.

Additionally, PISCES and NASA KSC have been assessing various construction methodologies for the FY15 Landing/Launch Pad Demonstration using the additive construction using basalt, to be completed by the end of 2015. Using the PISCES robotic rover as the central platform for construction, the team is evaluating technologies for sintering/stablishing the basalt surface, to include: induction furnace, microwave, solar, bricks / pavers, and …..Basalt Rebar.

Initial concepts include the PISCES rover depositing sinter basalt pavers for the inner-ring of the landing pad. Stabilized gravel will be applied to the outer-ring.

Additionally, PISCES see a potential to expand basalt rebar technology into terrestrial applications within the State of Hawaii as an emerging economic development project for civil engineering. Currently, Hawaii imports iron rebar from China, but has experienced the high expense of transportation and quality issues with the imports (rust, manufacturing quality, etc). Given the fact that the Hawaiian isles are made of basalt material, it follows that there may be industrial potential for eventually fabricating basalt rebar in Hawaii for a substitute to iron rebar for civil engineering projects within the State. This briefing will provide an overview of the technology, the unique partnership, progress update and testing leading to this flight opportunity.