GEOLOGICAL SPACESUIT TESTING. K. D. Runyon[1], [1]Johns Hopkins University Applied Physics Laboratory, 11101 Johns Hopkins Road, Laurel, MD, USA, 20723. kirby.runyon@jhuapl.edu

Introduction: Astronauts' scientific tasks on lunar and planetary surfaces will largely be the geological exploration of their site. Pressurized rovers proved a valuable tool for geologic exploration during previous Desert RATS (Research and Technology Studies; e.g., [1;2;3]). While spacesuits keep crew alive during missions, the suits also allow mobility so as to maximize scientific return from geological field studies. Thus, spacesuits are a geological tool in their own right.

Spacesuited test subjects on Earth provide valuable feedback for spacesuit design. With their knowledge base, geologists serving as spacesuit test subjects are uniquely positioned to adapt terrestrial field geological techniques for use on the Moon and elsewhere.

I was recently sized for the Mark 3 Spacesuit as a geologic spacesuit test subject. This involved body measurements and adjusting gloves, suit harness tightness, and pant sizings. This laid the groundwork for my future participation in adaptation of terrestrial field geology techniques for use in a spacesuit on the Moon.

Spacesuit Impressions: My ears popped as the spacesuit was pressurized to 4.6 psi above ambient conditions. Even with the suit supporting some of its own weight, I was struck with how heavy it felt; most of the weight was supported via internal backpack-like shoulder straps. While the weight wouldn't be an issue on the Moon, the inertia is: the suit "tried" to move my center of gravity away from over my feet, and this necessitated slow, thoughtful movements.

While I could not kneel, I could assume a lunge position with legs apart to allow picking up an object from the ground (Figure 1). However, my ability to "crunch" my abdomen to pick up the object was curtailed. This meant that I sometimes had to stand up, walk forward or back by a fraction of a step, and lunge again to pick up the object. A walking stick was a valuable asset, which [2] also discovered to be useful.

Finger and hand mobility was quite good. The current Phase 6 gloves allows a wide range of easy hand positions even when pressurized. Grasping and holding onto objects was not a problem.

Future Work: As a qualified geologist spacesuit test subject with NASA/JSC's Crew and Thermal Systems Division (CTSD), I am poised for inclusion on SSERVI teams, PSTAR grants, RATS, and other funded investigations.

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References: [1] Eppler, D., et al., 2013, Acta Astronautica, 90, 224-241. [2] Young, K., et al., 2013, Acta Astronautica, 90, 224-241. [3] Hurtado, J., et al., 2013, Acta Astronautica, 90, 224-241.

Figure 1. *Top Left:* Simple walking. *Top Right:* I could not reach the object by squatting. *Middle Left:* Lunging down allowed me to grasp the object on the ground, though sometimes multiple tries were needed to get my forward-backward distance correct to be able to reach the object. *Middle Right:* Considering a sample of vesicular basalt. *Bottom*: Getting my fingertips to exactly touch the glove tips is necessary for a nearly perfect glove fit.