

## MarsSkin Glove Analogue Research

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During Expedition Two, the MarsSkin team (James Waldie, Natalie Cutler) proposed to conduct an extended study into the impact of different types of EVA suit gloves on astronaut performance. Prior to the expedition, students from the University of Technology Sydney (UTS) Geology Dept contacted the MarsSkin team to discuss participation in this research.

In the evening of Tuesday 3rd Aug James and Natalie met with the students to discuss proposals for experimental tasks to be performed by the test subjects. Three tests were collaboratively designed, requiring varying degrees of dexterity, touch sensitivity and glove flexibility:

- *Sample bagging* – Subjects were asked to sort and bag rock samples. This involved handling rocks of a variety of sizes and shapes, as well as sealing several zip-lock plastic bags.
- *Brunton measurement* – Subjects were required to remove a Brunton instrument from its leather pouch, align it to a surface and perform a fine adjustment to centre a spirit level bubble so that surface inclination could be measured (note that actual measurement was not part of the task).
- *Maintenance Task* – This task was performed in two parts. In the first part, subjects were required to pick up a nut and screw it to the base of a bolt fixed to the horizontal surface. The second part was to pick up both a nut and a bolt and screw the nut to the base of the bolt.

The time taken to complete each task was to be recorded for each of the following:

- *Naked Hand*
- *Gas-pressurised glove analogue* – simulated by a ski glove treated with fabric stiffener. This has been found in previous studies to be a good analogue for the current gas-filled space suit glove.
- *Mechanical Counter Pressure (MCP) glove analogue* – simulated by a Mountain wear 'Powerstretch' glove, found in tests at MDRS to impact performance most similarly to the actual MCP glove. A cray-fishing glove was used as the outer protection layer.

In order to obtain a good test population, 40 students visiting Arkaroola from the International Space University volunteered to act as test subjects. After an initial briefing by James, testing was conducted over two evenings with the UTS students timing and organizing participants.

This research was completed successfully and the participants found the tests both informative and entertaining. Many commented that they had developed a new respect for current astronauts and the challenges they face in even the simplest aspects of EVA tasks. The clear need for a better space suit glove technology for a mission to Mars was also commented on.

This research will be an input into James Waldie's PhD research. It will also be used for further development of the MarsSkin MCP analogue space suit.

*Natalie Cutler*