UW Regolith Rangers Saddleback Sampler

NASA Micro-g NExT 2024-2025

Contact Sampling Device

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Project Description

- Micro-G NExT is a competition arranged by NASA that has teams design tools and systems that could be used in future missions to the Moon
- One of the purposes of future Artemis missions is to collect a sample of regolith in which the original grain orientation may be observed and analyzed on Earth
- The sampling device will provide a method of collecting a regolith sample and transporting it back to a moon base and/or Earth while maintaining grain orientation

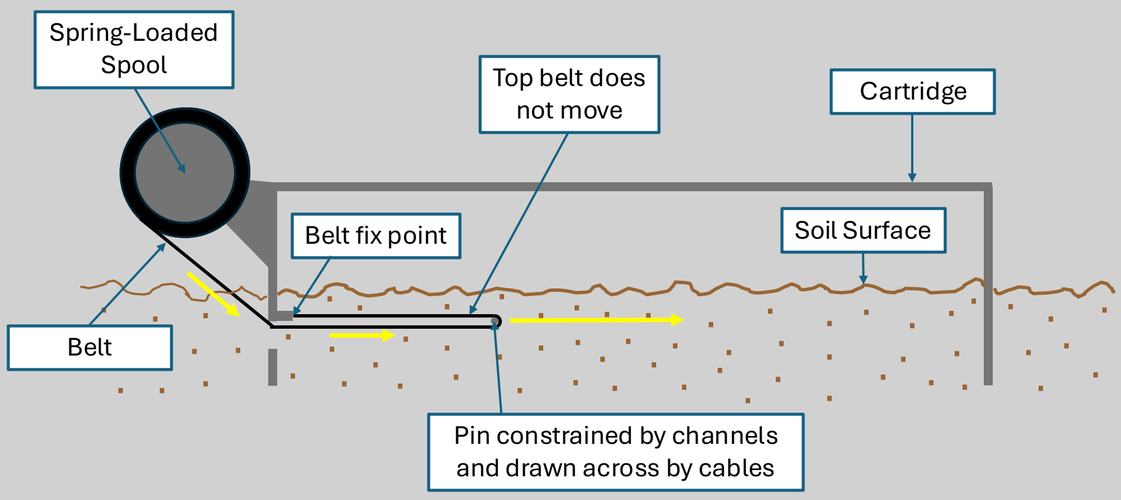

Figure 1. Cut-Away Conveyor Collection Concept Diagram

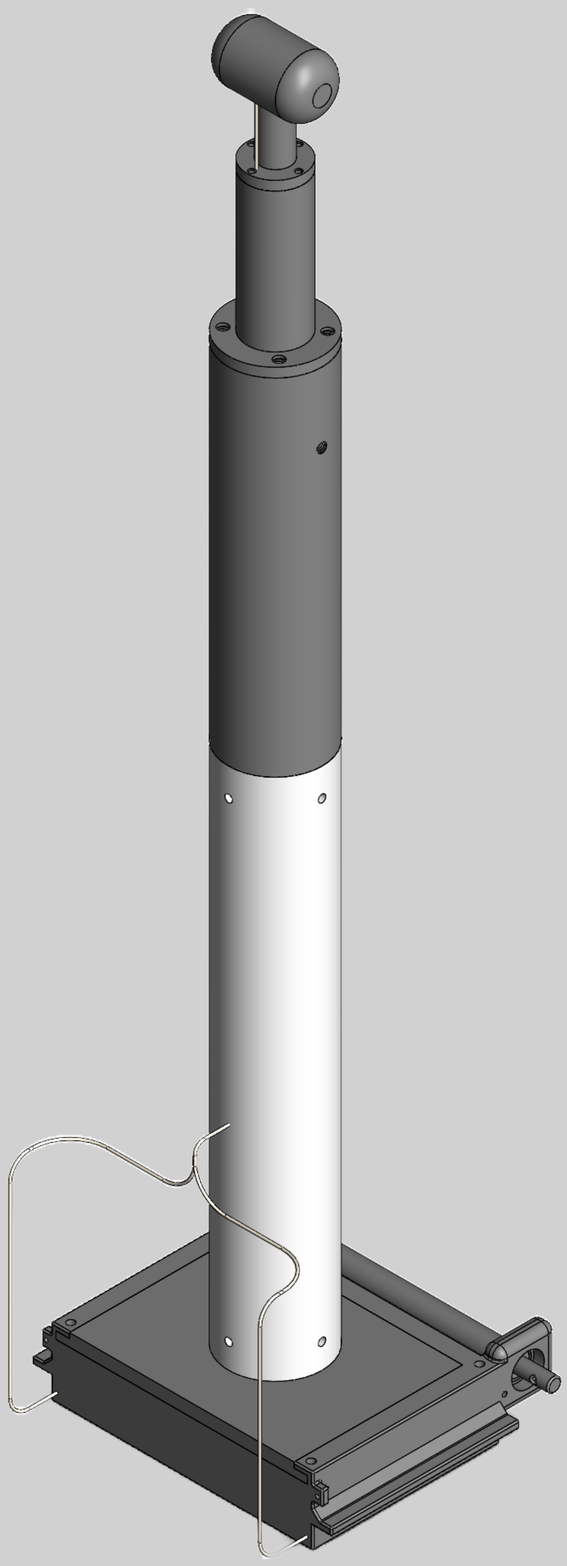

Figure 2. Full Assembly

Final Design

The Regolith Rangers have designed the device to be manually operated by a suited astronaut. In addition, the device has been designed to be easily serviced with a design that is quick to disassemble and assemble. The device preserves the grain orientation of surface level particles by using an inverted conveyor belt system. When the pull handle is actuated upward, cables will pull a pin horizontally just underneath the surface of the soil sample. A conveyor belt stored on a spool and wrapped around this pin will then unspool, capturing the soil sample on top of the conveyor belt and sealing the sample in the cartridge. The top of the conveyor belt is fixed, ensuring the sample on the belt does not shift while the belt actuates.

Design Requirements

The device must…

- Collect a regolith sample at a depth between 0.04-0.2in
- Collect a sample area between 9in^2 and 64in^2
- Preserve the original grain orientation of the sample
- Not exceed 8x8x36in while stowed
- Not exceed a weight of 10lbs
- Not require more than 10lbf of linear actuation
- Not require more than 30in-lb of torque to actuate
- Not have any pinch points or sharp edges
- Not have holes between 0.5in and 1.4in (finger entrapment)
- Have a factor of safety of 2.0 or more by ultimate stress
- Be usable with EVA gloves of a suited astronaut
- Be properly labeled according to NASA guidelines

Materials

- Majority of structural components made with 3D printed Tough PLA
- Prototypes are created with regular PLA
- Shaft composed of PVC tubing
- Pins, bearings, and springs made of stainless steel and purchased from hardware suppliers
- Collection belt and cables are made of nylon and sourced from hardware suppliers
- Cable shrouding created from plastic tubing

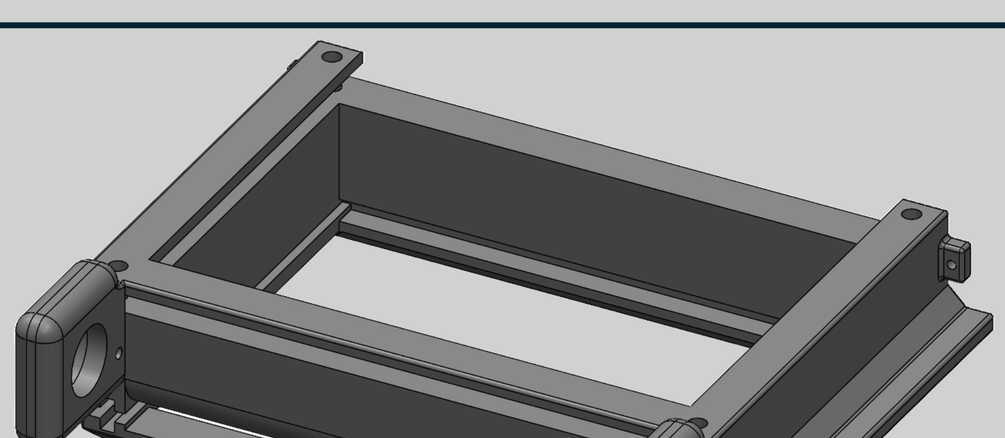

Figure 3. Sample Collection Cartridge