

**Low Cost Robotics for Lunar Science and Exploration.** A. M. Qureshi, Maxar Space Robotics LLC, 1250 Lincoln Ave, Pasadena, CA 91103. (Contact: [atif.qureshi@maxar.com](mailto:atif.qureshi@maxar.com))

**Introduction:** Maxar is a proud partner in NASA's return to the moon and is excited to enable the timely and important lunar science needed to accomplish this. Maxar Space Robotics has been a leader in robotic systems and mechanisms for a variety of extra-terrestrial applications for almost 25 years. We will present and discuss our latest efforts, relating to operations and science on the lunar surface, and aligned with all the LSII focus areas.

While NASA's Commercial Lunar Payload Services (CLPS) program has successfully reduced the cost and increased the frequency of lunar surface access, there is still a need for similar improvements in robotic manipulation systems. These are critical for science payloads that require positioning and pointing capabilities removed from the lander, or that require direct contact with the lunar surface. They are also crucial to support long term sustainable infrastructure development in support of exploration goals. Maxar Space Robotics is pioneering low cost lightweight lunar robotics and is investing in advanced technology to deliver revolutionary capabilities in the near future.

**SAMPLR:** The SAMPLR mission features our low cost modular robotic architecture. This mission will demonstrate techniques necessary for In Situ Resource Utilization (ISRU) and excavation. We have developed a right-sized and readily reconfigurable robotic system, composed of simple and mature components. These are readily available at reasonable cost and lead time, allowing the manipulator to be customized to a particular mission's needs and then delivered quickly and within a constrained budget. The first flight unit of this robotic arm system will be delivered in late 2021 for integration with the lander. SAMPLR will be landing at the Lunar South Pole in 2023.

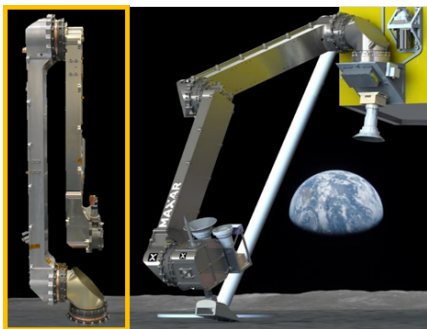


Figure 1 – SAMPLR Mission (R) and Engineering Model (L)

**LUnA and SolarHub:** We are partnering with NASA to develop the Lunar Under Actuated (LUnA) robotic arm, as well as the SolarHub Lunar Vertical Solar Array system. LUnA is being supported by the NASA Tipping Point program, and represents a revolutionary leap forward in space robotics, driving all the manipulator joints from a single actuator and motor located at the base, rather than equipping each joint with its own actuator. This simple change has a number of beneficial effects: reducing cost and mass while maintaining the capability of the robotic system, and also improving the system performance in extreme environments. This allows it to work in difficult locations like Permanently Shadowed Regions (PSRs) of the Moon, and also allows it to more easily survive through the night to support long term sustainable operations. LUnA will minimize cost and mass impact on a mission, and also provide advanced robotic capabilities such as sample packing and stowage, and payload swap out (for multi-instrument science).

On SolarHub, Maxar will apply Electrodynamic Dust Shielding (EDS) to mitigate the effects of Lunar dust. This technology has been under development at Kennedy Space Center (KSC) for many years and has reached a high level of maturity. The SolarHub project will adapt it to provide dust protection to rotary actuators and other moving mechanisms, paving the way for its application on robotic manipulator systems.



Figure 2 – LUnA Concept with Cutaway View (L) and SolarHub (R), which will adapt KSC EDS Technology