High-capability, Low-mass Lunar Mobility at an Affordable Price

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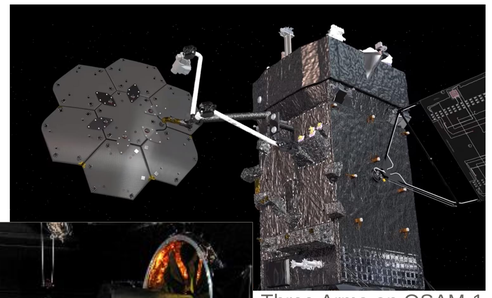
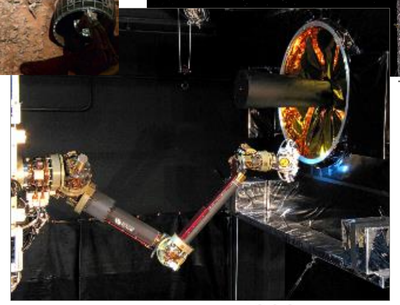
Decades of Heritage & Investment

Six Arms on Mars



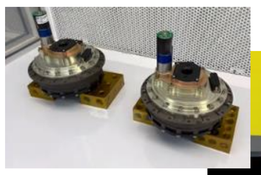
Three Arms on OSAM-1

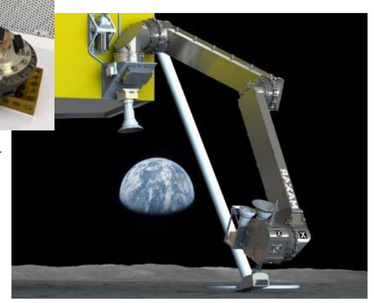


Two Arms on RSGS

Maxar has extensive heritage in Planetary instruments, robotics, and OSAM (On-orbit Servicing, Assembly, and Manufacturing). Previous robotic systems were, by necessity, custom-made whether due to mass constraints of a Mars mission or first-of-kind missions in orbit. However, the industry is changing rapidly. Access to space, and soon the lunar surface, is becoming frequent and affordable. To enable a thriving lunar economy, robotic systems will have to be equally capable, affordable and rapidly available. However, each mission remains unique in many ways. To address this challenge, Maxar's next generation hardware is productized and modularized – allowing the same products and heritage to be applied to a wide variety of missions.

This new product line targets a wide range of applications while purposely avoiding the temptation to do everything – enabling a very affordable and flexible toolset. Both the SPIDER assembly mission and the SAMPLR Lunar arm leverage this approach and, in the case of SAMPLR, realize an order of magnitude cost savings by doing so.

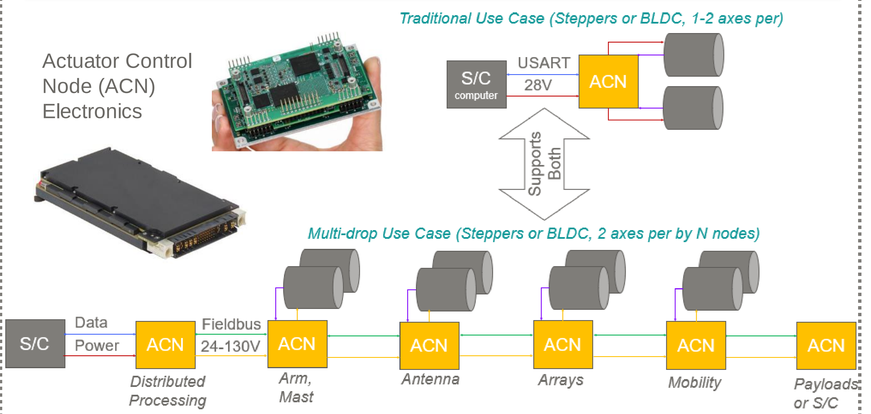




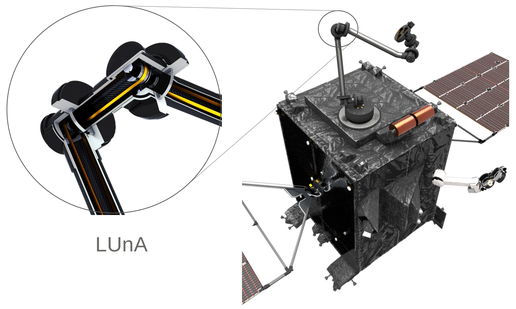
SAMPLR Arm & Modular Building Blocks Manifested on CLPS TO19C, Landing 2023

Next Gen Capabilities & Innovation

To enable lunar robotic systems and mobility to proliferate, it must be easy and affordable to add actuation wherever it is needed. Capable science and exploration systems will require many actuators and degrees of freedom (DOF). The cost and mass of these systems must be driven down and Maxar is doing so in numerous ways. First, Maxar has developed flexible Actuator Control Nodes (ACN). These come in multiple formfactors and leverage a high-bandwidth, multi-drop architecture. Utilizing state-of-the-art components has also enabled significant miniaturization & cost savings.

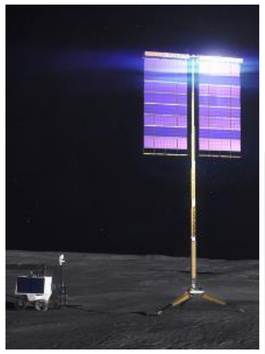


As part of NASA's Tipping Point program, Maxar is advancing its Lunar Under-actuated Appendage (LUnA) technology to be ready for flight in the near term. The technology utilizes a single actuator at the base connected to any number of rotary joints in combination with electro-static brakes at each to determine which are engaged. This drastically reduces the cost and mass while also enabling lunar night survival and operation because all sensitive components are contained in the warm base enclosure.



LUnA

LVSAT

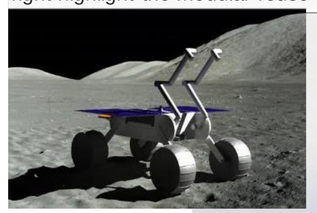


Maxar is working with NASA on the LVSAT (Lunar Vertical Solar Array Tech) program to advance the state of the art in power systems while also leveraging NASA deployable boom and dust mitigation technologies.
Finally, our highly optimized structures are generated via an automated process, and then joined with 3D printed titanium nodes in a quick turn process very applicable to lunar missions and vehicles.

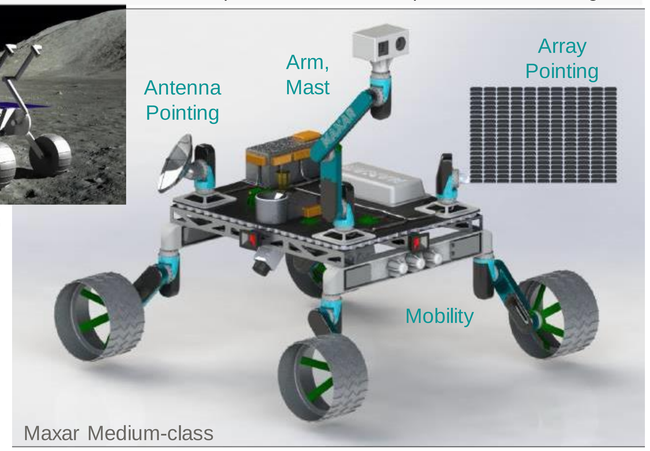
Advanced Composite Spacecraft Structures

Mobile, Affordable, Low-mass Missions

As it has for Mars, mobility will become a de facto science enabling capability on the moon – but how to accomplish that within the mass and cost profile of CLPS? Current micro rovers have very limited capability and would benefit from added functionality. VIPER class rovers are much more capable but have a higher price and push the limits of landed payload mass. Maxar has developed breakthrough mobility solutions that address these challenges with a combination of heritage robotics, next generation products, and innovative new technologies. These solutions add capability and the high number of degrees of freedom that rovers ultimately require - without the typical cost or mass penalty.
The images below show Maxar small-class and a medium-class rovers, each leveraging these technologies in different ways – and each with options to survive lunar night due to incorporation of these technologies. The teal components in the image at right highlight the modular reuse of Maxar products which also provides cost savings.



Maxar Small-class



Maxar Medium-class

Maxar has established a rover testbed for quick iteration of new concepts and technologies. The Hybrid Iterative Testbed (HIT) was designed, from the start, to be modular and scalable. Using our existing family of actuators from very small to very large, it can take the form of anything from a micro-rover sized vehicle to something as large as the VIPER or Perseverance rovers. The current version shown below is a mid-class rover with independent suspension in front and bogie in back and vertical solar array for polar locations. The technology can be incorporated on existing landers or anything from two-wheeled trailers to six or eight-wheeled heavy equipment.

Maxar's Hybrid Iterative Testbed (HIT) for evaluating various mobility solutions