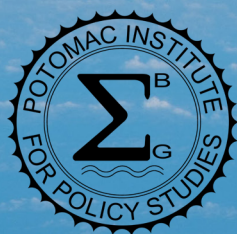


The Potomac Institute for Policy Studies
CEEDS Center Presents



The Future of Deep Space Exploration



Potomac Institute for Policy Studies

For decades, the US has led the charge in space exploration. American astronauts were the first to land on the moon. NASA's Pioneer, Galileo, Voyager, NEAR, and Cassini-Huygens missions continued to forge ahead: first to fly by Saturn, Uranus, and Neptune; first to orbit Jupiter and Saturn; first to land on an asteroid and first to land on Titan. These are but a few of the achievements of American deep space exploration over the last five decades. So what efforts are continuing today, and what does the future look like? On October 16, 2019, the Potomac Institute for Policy Studies' (PIPS) Center for Enterprise, Exploration, and Defense in Space (CEEDS) held a seminar titled: "The Future of Deep Space Exploration" to examine and discuss issues related to the next steps in the manned and unmanned exploration of our solar system.

It is important to first understand why it is beneficial to continue space exploration. The exploration of space has been a beacon of US leadership since the first moon landing. It has increased American prestige and allowed the US to be the de facto leader in developing the norms of space operations. Space exploration is the perfect opportunity for international collaboration to strengthen partnerships. Like the expedition of Lewis and Clarke, it is the first step in a greater move into the solar system. Without exploration, there can be no return trips, and certainly no permanent home elsewhere in space. Space science missions also allow us to understand the origin of our planet, our solar system, our galaxy, and even the entire universe. Furthermore, as is evidenced by each previous space program the technological development necessary to complete ambitious scientific and manned expeditions directly leads to advancements in science and technology for the rest of society. However, most of all, continued space exploration has a unique effect on the human species, raising aspirations skyward and inspiring dreams in hearts and minds across all ages.

"The Future of Deep Space Exploration" panel participants offered visions for both manned and unmanned American space exploration for NASA, commercial companies, and research organizations like universities. Their perspectives included a bird's-eye view of the opportunities and challenges arising from recent models of both funding and program execution, and mission directives, as described in brief below.

For manned exploration by all sectors, there are many challenges. Most notably are ever-changing priorities regarding the destination from administration to administration, and fickle congressional budgets. This makes it exceedingly difficult to plan and execute a multi-year program, and often results in dead-end development and unreachable horizons. Panelists noted that despite this, there has been remarkable consistency of vision in the previous four NASA authorization bills, which simply direct NASA to explore beyond Earth, to include, the Moon, Mars, and other destinations. Citing various studies across the last two decades, there are many ways to do this, each with different levels of cost, risk, and speed.

In December 2017, the administration issued Space Policy Directive 1 (SPD-1), which offers a roadmap to achieve the mission laid out in the NASA authorization bills, by regaining momentum in space exploration and then maintaining it. A key idea of SPD-1 is sustainability. Sustainability ultimately means affordability, brought about by retaining supply chains and industrial support bases across programs, designing systems that can be applicable for numerous future missions, and building an ecosystem of commercial companies to eventually develop an economy of scale for exploration.

In support of this directive, NASA is executing the Artemis program to conduct science, return humans to the moon by 2024, and create a lasting architecture that can eventually propel humanity from the Moon to Mars. The Commercial Lunar Payload Services (CLPS) program will contract with numerous private companies to conduct science missions across the entire surface of the Moon and provide NASA with the necessary capabilities to build a robust and lasting infrastructure. It is a new and innovative model that allows commercial companies to innovate to meet requirements without NASA involvement in every aspect of the design and construction of the systems. Artemis carries on the spirit of sustainability of SPD-1 by keeping the goal of Mars firmly in its sights. The program will use the Moon as a proving ground for technology, conduct the science necessary for in situ resource utilization, and allow NASA to study the effects of radiation exposure outside of low Earth orbit on astronaut health and performance. The 2024 deadline instills a sense of urgency, while providing a roadmap of achievable goals that can sustain momentum and keep costs of future missions at an acceptable level.

The MILO Institute for Space Science has also developed a new and innovative model to conduct space science. Unfortunately, due to the expense of missions and reality of finite funding, only a small fraction of Space Science are greenlit. MILO aims to fix this issue by enabling as many scientists, engineers, and students throughout the world – including many of them who don't have much experience – to design, develop, and conduct deep space missions. The goal is to build a global consortium of MILO members to self-fund deep space efforts. By spreading the cost of each mission across a large number of differently sized institutions, expensive missions can be conducted that benefit each member organization.

American astronauts are well on their way back to the moon, with numerous commercial companies supporting the Artemis program. Organizations like the MILO Institute for Space Science is redefining how space science is conducted, and democratizing access to space. The timeline for space exploration ventures is long, and the technological developments needed are difficult, but with sustainable architectures, continued congressional support, a growing commercial market, and achievable goals, we can continue to explore and expand beyond Earth, with America at the helm.



Image: NASA

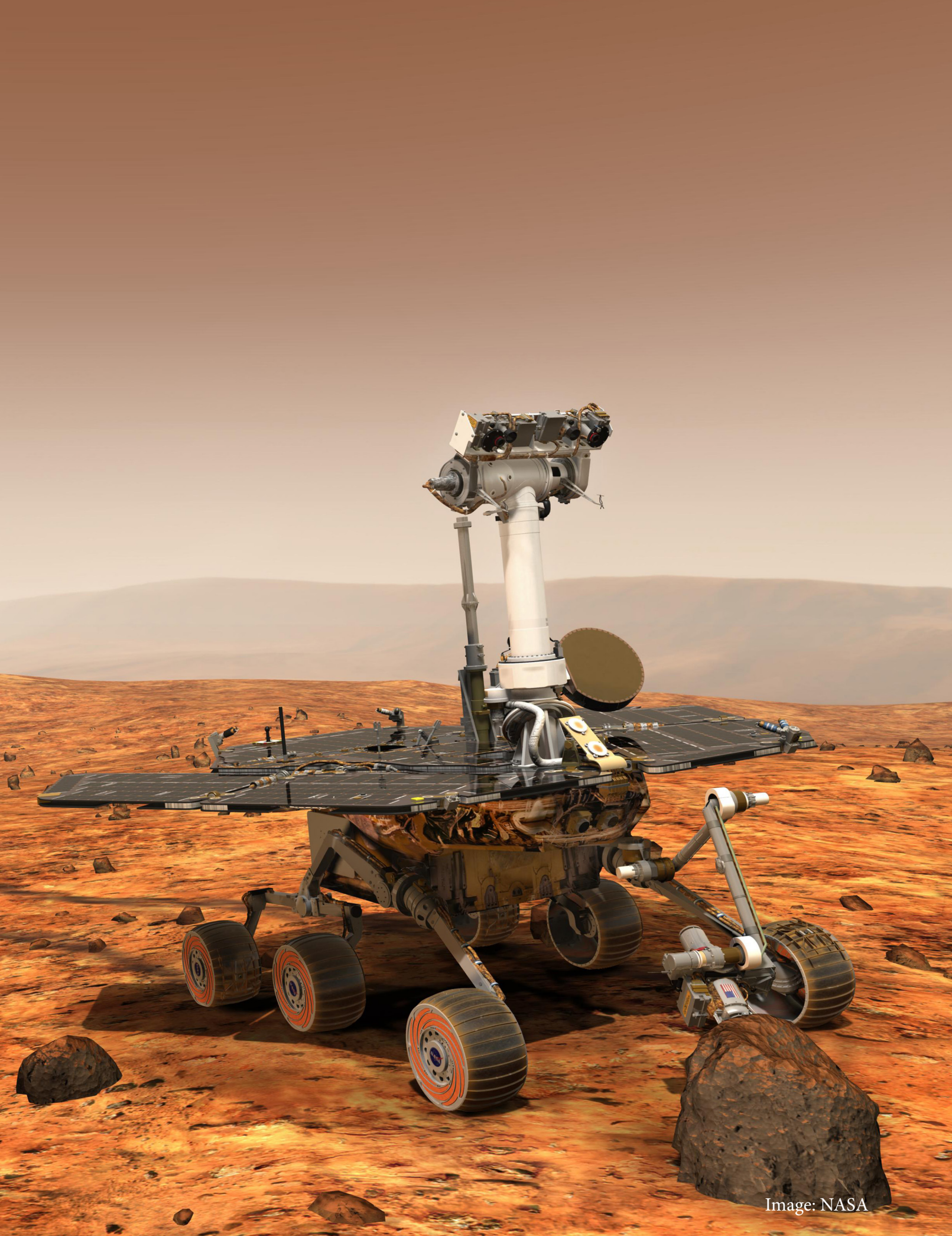


Image: NASA