

## The Era of Commercial Space Mining Begins

By Alex Gilbert and Morgan Bazilian

In early September, NASA [announced](#) a [ground-breaking solicitation](#): NASA wants to buy lunar regolith extracted by a private company. In order to spur commercial space resources technology, NASA's procurement is for the purchase of 50-500 grams of lunar regolith, or rock materials, from the surface of the Moon.

After collecting the lunar material, establishing commercial ownership of it, and photographing it, the selected contractor(s) will transfer ownership to NASA in-place on the Moon. Ideally, NASA hopes to be able to purchase the material by 2024, the target date for the return of American astronauts to the Moon under the [Artemis program](#). The basis for the decision will be, “low price [and] technically acceptable”.

NASA's proposal heralds the era of commercial space resources extraction. It also demonstrates the power of government to help catalyze markets and innovation.

Under the [Outer Space Treaty](#) (OST), the “constitution” of international space law, no part of outer space can be appropriated by national governments. This provision was meant to prevent a land rush in outer space. [Space resources policy is still nascent](#), though it has been discussed for decades. There is significant legal controversy over whether the OST allows the production of outer space resources. Russia, in particular, has objected to US space resource activities as a violation of the OST.

In recent years, many countries have begun to develop legal frameworks to enable the production of space resources without national appropriation of the celestial bodies they are produced from. In 2015, the U.S. passed the Commercial Space Launch Competitiveness Act, which guaranteed property rights to US citizens for resources extracted in outer space. Other nations are developing similar legal frameworks, such as Luxembourg and the United Arab Emirates. More recently, the Trump Administration has been supportive of space resources development with both an early [2020 Executive Order](#), and work for a future international framework called the [Artemis Accords](#).

NASA's move builds upon this work by providing the demand for a space produced material, and a legal basis for commercial extraction.

The ultimate owner in this case is a government entity whose interest is scientific. Government agencies globally regularly contract with private entities for space services. Under US law, any private entity that extracts lunar material owns it, and NASA's decision to purchase it and transfer ownership cements that claim. This NASA authorization could serve to unlock commercial services for future government space missions.

NASA is increasingly turning to the private sector for commercial space services. Most famously, NASA has contracted with SpaceX and Boeing to develop crewed launch vehicles to reach the International Space Station. SpaceX became the first commercial company to deliver passengers to orbital space this summer. Commercial Crew built upon the success of Commercial Cargo, which led to SpaceX's development of the Dragon cargo ship. NASA's new request continues this trend.

The primary science motive behind NASA's solicitation is its Artemis program to return American astronauts to the Moon. Currently operating under a target landing date of 2024, the Artemis program is relying extensively on commercial services. Ultimately, NASA's use of cheaper-than-government commercial services can enable Mars missions.

Many more countries are now space players. Private entities are also able to access the Moon, as demonstrated by last year's SpaceIL mission. At the same time, China continues to rack up success in its lunar science program, with ambitions to land Taikonauts on the Moon in the 2030s.

Just as geopolitical interest in the Moon is rising, so are the [geostrategic implications](#) of producing outer space resources. Space resources can reduce costs and enable otherwise infeasible space missions. They thus are of scientific, commercial, and military interest. Following regolith as a demonstration mission, the most likely resource to be prospected and mined will be lunar water.

In space, lunar water can be used directly by crew or processed into oxygen fuel. Fuel on the Moon can enable refueling of lunar landers while delivery of fuel off the Moon could enable in-space refueling. In-space refueling could reduce space access costs, enable more lunar missions, and even fuel future crewed Mars mission. Major spacepowers are now looking to the Moon in what may be the first space rush.

NASA's proposal is staking out a pathway for commercial and private entities to participate in future space resources production. By enlarging the size of the space economy and providing services to support Earth's population, commercial entities can help unlock the economic potential of space mining. In doing so, there are important legal, moral, and other debates about commercializing outer space.

Ideally, the space industries of the future can avoid the pollution legacies of the terrestrial industries. While there will be considerable controversy over the commercial nature of NASA's contract, the agency's decision is based on its belief that it will eventually improve space science. Ultimately, the expanded capabilities unlocked by commercial space resources could bring scientific benefits to all of humanity.

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