

→ Mark your confusion.

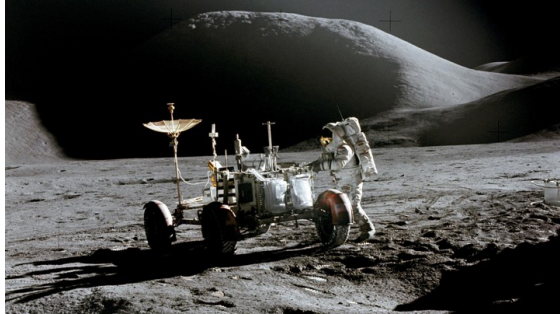
→ Purposefully annotate the article (1-2 mature, thoughtful responses per page to what the author is saying)

→ Write a 250+ word response to the article.

(If you are a teacher or student who would like to modify this Google Doc, go to File > Make a Copy. I cannot and do not respond to Share requests -- my apologies!)

The Moon Is Open for Business

By Marina Koren for *The Atlantic*, 9-27-18



(Above: An Apollo astronaut on a moonwalk in 1971)

For many years, launching things into space was the work of governments. Only national agencies had the money, the technology, and, when it was necessary, the political will to fly humans around Earth and send probes to explore other planets. That began to change in the past several years, as companies entered the scene with their own rocket technology. Today, the space shuttle no longer flies, but SpaceX's Falcon 9 rocket makes a trip every couple of weeks, delivering all kinds of satellites into orbit. Few had imagined this future even a decade ago, but now it seems quite normal, even routine.

Now another segment of spaceflight seems poised to repeat this shift: the moon business.

A number of companies have set their sights on the moon, and they're ramping up their plans to deliver spacecraft to its surface. They're finalizing spacecraft designs and securing launch contracts, and they've set some fast-approaching deadlines. Only three nations—the United States, the Soviet Union, and China—have successfully soft-landed on the moon, and their missions were all carried about by national agencies. (Other nations have crash-landed, which is exactly what it sounds like.) No company has ever placed a spacecraft on the moon, but if a few key players have their way in the next decade, the lunar surface may soon be littered with them.

Last year, Astrobotic, a U.S. company, announced it would send a lander aboard a United Launch Alliance Rocket in 2019, in time for the 50th anniversary of the first moon landing. In July of this year, SpaceIL, an Israeli organization, said its spacecraft will launch aboard a Falcon 9 rocket in December and land on the moon in February 2019. Also in July, Blue Origin, Jeff Bezos's company, said it had targeted 2023 for a spacecraft landing. And this week, ispace, a Japanese company, announced that it had signed a contract with SpaceX for two lunar missions: The first, in 2020, would deliver a probe to orbit the moon; and the second, in 2021, would attempt to land a spacecraft that would deploy several rovers to explore the surface.

For these companies, the moon is not the nationalistic dream that it was during the Apollo era. It is a marketplace. Instead of leaving flagpoles in the regolith, they want customers, in the government and commercial sectors, who will pay them to deliver their hardware to the moon, or mine its crust for minerals. They want to help convert the ice on the moon into usable resources, such as fuel for a deep-space mission. And they want the work to produce revenue, just as rocket launches have for SpaceX.

Remember, of course, that deadlines in the spaceflight business are always subject to change, and often do. And the commercial moon industry recently experienced a minor setback. In 2007, a Google-sponsored competition challenged privately funded teams to develop, launch, and land a rover on the moon. The contest was canceled in January of this year—and the \$20 million in prize money went unclaimed—when it became clear that no one would meet the deadline of spring 2018. The unsuccessful competition seemed to suggest that privately financed moon missions were not yet realistic, but some of

the finalists, like SpaceIL and ispace, have pushed forward anyway.

NASA's culture of optimism is too much of a good thing.

“This is something you need to be thinking about now if you want to get your foot in the door early and establish your presence there,” says Aaron Sorenson, the global communications officer at ispace. “We can’t just be this dreamy start-up that’s excited about going to the moon. We need a sustainable business.”

You may wonder: Where is the world’s premier space agency on all this?

Under the Trump administration, nasa has made a serious push toward commercial activity on the moon. In one case, the support came at the expense of a government mission.

In April, nasa announced it would no longer fund the Resource Prospector, a mission that would have sent a small rover to excavate material at the moon’s poles in search of ice and minerals. Resource Prospector, already nearly a decade in development, was nasa’s only planned robotic mission to the surface of the moon. Jim Bridenstine, the nasa administrator, said some of the instruments that were designed for the mission could be used in commercially funded efforts. On the same day nasa announced the demise of Resource Prospector, the agency published a notice soliciting proposals from contractors seeking to develop technology for payload transportation to the moon.

Under Trump, NASA has pivoted from Mars to the Moon.

The moves sent a clear message on future moon exploration: Under the current administration, nasa won’t produce robotic missions in-house, but it will encourage U.S. companies to do so. Bridenstine has said he wants to put nasa-supported commercial landers on the lunar surface as early as 2019.

The overlapping ambitions of multiple companies are great fodder for daydreams about the future of lunar exploration. The world hasn’t seen a tightly packed schedule of moon missions since the 1960s and ’70s. The scenario is especially alluring given some recent scientific research, including the most definitive proof of ice at the moon’s poles, reported last month. The astronauts of the future could feed this ice into the life-support systems of lunar outposts or transform it into spaceship propellant for missions to other parts of the solar system.

These are very distant ambitions, of course. For now the goal is to land something gently on the moon instead of blowing it up into a million pieces. For the first company to pull that off, I have only one request: Please don’t accidentally drive over Neil Armstrong’s footprints.

Response option(s):

- Where do you think humanity’s space exploration efforts should focus: Mars, or the Moon? Explain.
- If taking a trip to the moon cost as much as a house does today (about \$100,000), would you do it in your lifetime? Explain.