



AMERICAN FOREIGN POLICY COUNCIL

DEFENSE TECHNOLOGY PROGRAM BRIEF

The Case for Space Development

By: Lamont Colucci

BRIEFING HIGHLIGHTS

Russia and China have surpassed the U.S. in the military space sector, as well as in the development of civilian space. Their innovations include China's proposed work in Space-Based Solar Power (SBSP) and testing of anti-satellite weapons, as well as Russia's advancement of hypersonic missiles. China intends to build space vessels that utilize nuclear propulsion, colonize the moon, and potentially create areas of anti-access and area denial in space. This activity belies the geopolitical imperative of primacy, now playing out in a new strategic domain.

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Development of the near-space economy will require economic and industrial output and innovation that will fundamentally change the international economic system in ways not seen since the transformation that accompanied the Industrial Revolution. It will also require mankind to reorient its economic system as a whole.

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Over time, space transport will revolutionize the global economy generally and several industries in particular—namely, aerospace & defense, IT hardware, telecom sectors, space tourism, package delivery, and energy. It will be energy that might have the most immediate and direct impact on the lives of Americans, as it will eliminate many of the problems surrounding climate change and conflict over fossil fuels.

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Many of those who oppose the Space Force did so because they see space as primarily a realm of exploration and scientific interest. Yet if we want it to become more, an arena for commerce and innovation, we will need to ensure its safety and security. That, in turn, requires a new type of military thinking.

The Trump administration's creation, in late 2019, of the U.S. Space Force, as a free-standing branch of the American armed forces and concurrently the reestablishment of the U.S. Space Command, has brought new and much-needed attention to what is a critical emerging domain: space. What remains lacking, however, is a broader strategy to properly frame and articulate American priorities in the space domain, and to guide U.S. conduct within it.

Such a strategy begins with a mapping of cislunar space, a domain that encompasses near-space environment between Earth and the Moon. Cislunar space is the space between the Earth's atmosphere and the area right beyond the orbit of the Moon. Strategically, cislunar includes the Lagrange points, which are the points in space where there is an equilibrium between Earth's and Luna's gravitational force. It is an area that holds military, political, cultural and economic consequences that will determine the success or failure of American strategic primacy for the 21st century and beyond.

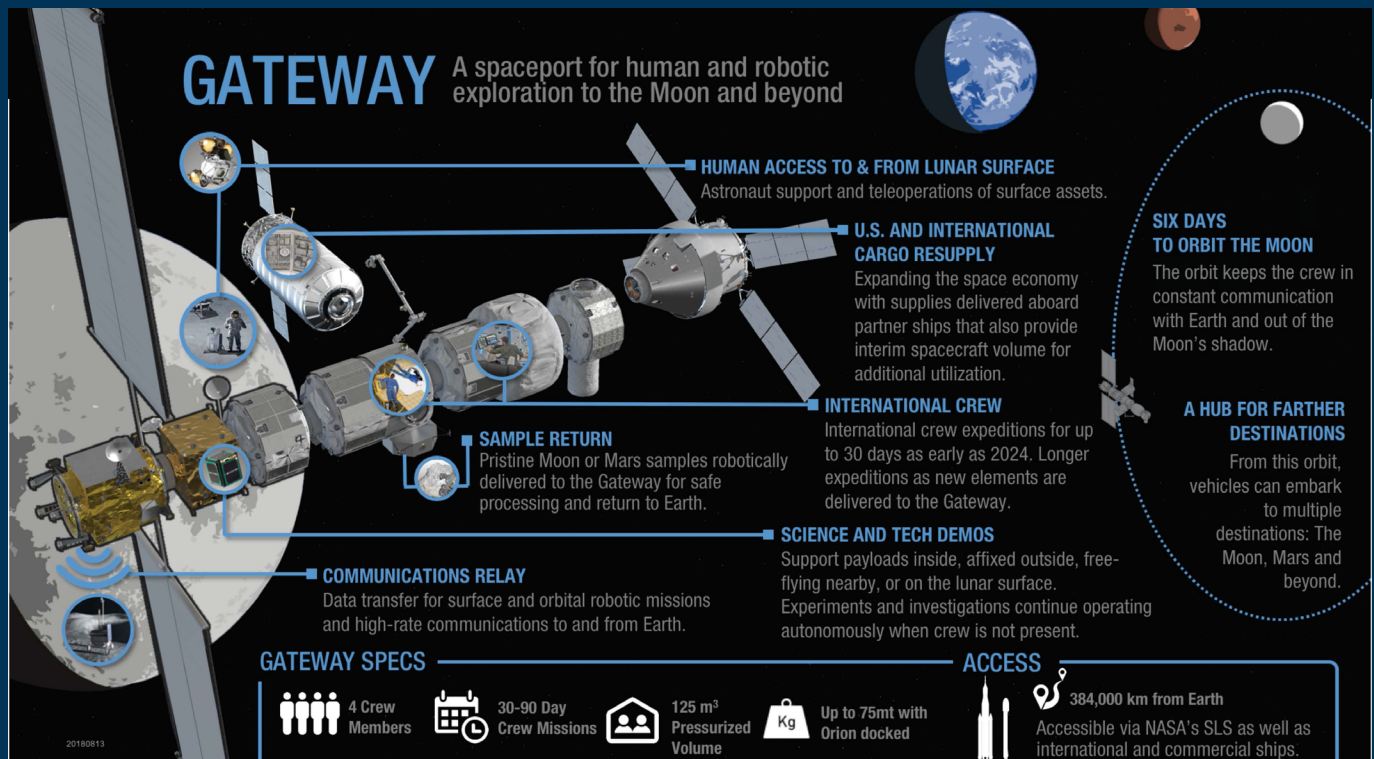
THE ECONOMICS OF NEAR SPACE

Any discussion of space development needs to begin with a basic question: is it worth it? While the projected evolution of a space economy is still conceptual in nature, it is already clear that the benefits of space development will be innumerable.

As it stands, the realm of space represents a nascent—and as yet mostly untapped—market. An increase in space satellites would facilitate a faster and more reliable internet on Earth, as well as reinforce the speed and reliability of calling and messaging on terrestrial telecom networks. Shipping capabilities in space could also be a growth industry, and eventually blasting a payload into space will become less costly and faster than shipping across an ocean or via commercial aircraft. Asteroid mining is also a likely space industry—and potentially an extremely lucrative one. Resources that are often scarce on Earth are many times as plentiful on asteroids across the galaxy.

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FIGURE 1: NASA GATEWAY PROJECT



Source: William Gerstenmaier and Jason Crusan, "Cislunar and Gateway Overview," NASA, <https://www.nasa.gov/sites/default/files/atoms/files/cislunar-update-gerstenmaier-crusan-v5a.pdf>

Over time, space transport will revolutionize the global economy generally and several industries in particular—namely, aerospace & defense, IT hardware, telecom sectors, space tourism, package delivery, and energy. It will be energy that might have the most immediate and direct impact on the lives of Americans, as it will eliminate many of the problems surrounding climate change and conflict over fossil fuels. This will be especially true if America becomes the leader of space-based solar power.

*This new **economic revolution** will grow exponentially from its inception. Morgan Stanley estimates that the "**space industry**" will generate 350 billion dollars annually, a figure which could **grow to \$3 trillion a year** if this system begins to be implemented.*

The creation of strategic trade routes in "near space" will hearken back to the change in trade and globalization during the Renaissance. The term "globalization" will need to be altered, and a new term such as "cosmos-

ization" will replace it in more than a name. The NASA Gateway project (see Figure 1), which will be built in orbit around the Moon, will deliver goods, services, and personnel to and from the lunar surface.¹ This mission currently depends on the Space Launch System (SLS) and Orion spacecraft.

This new economic revolution will grow exponentially from its inception. Morgan Stanley estimates that the "space industry" will generate 350 billion dollars annually, a figure which could grow to \$3 trillion a year if this system begins to be implemented.² This, however, does not even account for the upward changes created by the continually evolving technology created by the space economy as it evolves.

In order for this to happen, however, an industrial reorientation is necessary. Simply focusing on exploration and scientific discovery are not sustainable economic and strategic models purely in themselves. Development of the near-space economy will require economic and industrial output and innovation that will fundamentally change the international economic system in ways not seen since the transformation that accompanied the Industrial

Revolution. It will also require mankind to reorient its economic system as a whole. This imperative may be hard for many people to grasp, but it is also why America will have the best chance to lead this new economic revolution. After all, it was America that landed men on the Moon and answered the call of President Kennedy's dream. American culture and history are infused with the ability to pivot and adapt and innovate. It will need a rebirth of the frontier spirit and a declaration that what famed historian Frederick Jackson Turner said in 1893, that the closed frontier has been reopened on a much grander scale.

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This, in turn, requires us to seriously tackle the matter of security in space. Many of those who oppose the Space Force did so because they see space as primarily a realm of exploration and scientific interest. Yet if we want it to become more, an arena for commerce and innovation, we will need to ensure its safety and security. That, in turn, requires a new type of military thinking.

SECURITY MATTERS

In the context of space, security can be viewed on two levels. The first is international security – that is, the security of the international system as a whole. The second is the security of the western alliance: western nation-states (including the U.S.), their allies, their economy, their values, and their political culture. A serious plan for the former, if carried out by America and its partners, will necessarily serve to bolster the latter.

Currently, the global system has no protection against an extinction-level event, nor is there an alternative for human civilization to escape a disaster. At first blush, this state of affairs may seem acceptable, but it becomes decidedly less so once one grasps the dangers posed by asteroid collisions, a Carrington Event (solar storm), and a number of other existential dangers. The current coronavirus pandemic provides a case in point; although far from a civilization-ending event, the disease has nonetheless illustrated the weaknesses,

vulnerabilities and gaps in our ability to protect national populations, as well as the fact that there is no alternative but to do so.

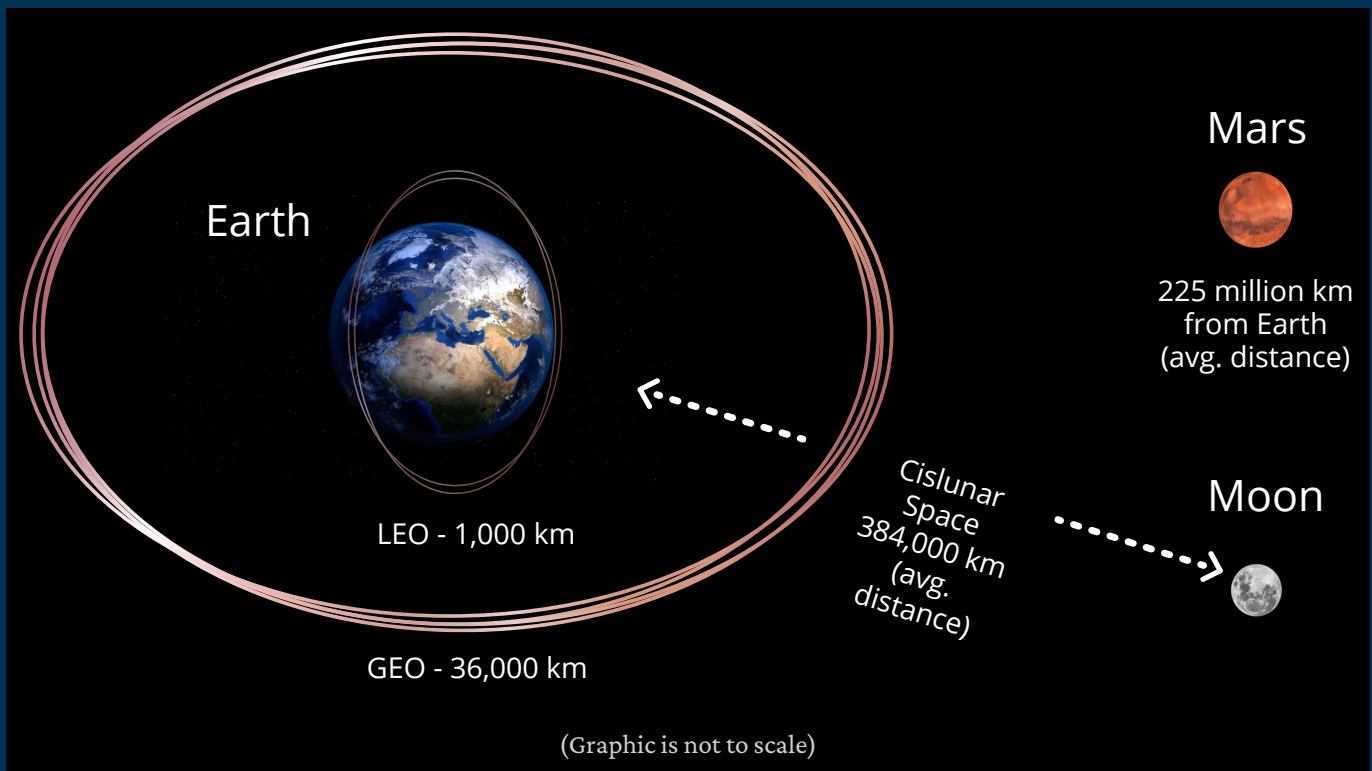
The same holds true for space. As the United States moves more and more into the space domain, the imperative will grow for the nascent economy there to be protected. On a mundane level, it will need to be protected from space debris, which can wreak havoc on space-based technologies such as satellites. There will also need to be a defense against a breakdown in communication or travel.

But other security needs prevail as well. No economic system can viably exist without adequate safeguards. That is the reason nations, irrespective of political and ideological outlook, have uniformly created penalties for threats to private property, penalized breach of contract, and provided security from hostility, violence, chaos, and criminality. There should be no doubt that a new economic revolution in space will foster the same challenges there. From the potential of electronic disruption to the (currently fanciful) notion of space piracy, the space domain will assuredly face potential criminality and sabotage as it develops. Assuring that this disorder stays at a minimum will go a long way toward instilling confidence in the emerging space economy.

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Therein lies the conceptual case for a more robust American military presence in space. On June 18, 2018, President Trump changed the space dynamic by ordering the DOD to create a new sixth branch of the military entitled the Space Force, whose job will be to unify American national security concerns regarding Space. It was created as part of the 2020 National Defense Authorization Act. The current mission is to train, equip, and organize forces for space. In August of 2019, the United States reactivated U.S. Space Command as a unified combatant command whose job currently is to “conducts operations in, from, and to space to deter conflict, and if necessary, defeat aggression, deliver space combat power for the Joint/Combined force, and defend U.S. vital interests with allies and partners.”

FIGURE 2: THE TRIPLANETARY PROJECT SPACE



A LOOK AHEAD AT A TRIPLANETARY PROJECT

The Triplanetary project, encompassing the Earth/Moon/Mars (see Figure 2), is an idea which recognizes that the strategic future of the United States in specific, and the western alliance in general, is not confined to cislunar space, and extends out to Mars as a way of ensuring prosperity for humanity. The name is more for literary purposes rather than literal, as the Moon isn't actually a planet, but the project itself envisions a future of robust commerce and safe human transport spanning the range of space between Earth and Mars.

Space explorers, colonizers, and entrepreneurs see Mars as the future crown jewel. "Newspace" advocates view Mars as the initial epicenter of a serious human presence among the stars. However, there are several developments that need to be completed in order for this dream to become a reality. The first stage of a Triplanetary economy would be an exchange of goods and services between two Earth-based entities in space (the Earth and Moon). An asteroid mining company may lead the economic impetus that will send raw extractions to a "floating" base, or to a moon-based processing plant

where the minerals and metals can be extracted and used. Future stages would expand from Low Earth Orbit (LEO), Geosynchronous Equatorial Orbit (GEO) and cislunar space on to the Moon, and then Mars.³ Basic resource use will eventually become trade, communication, and energy production, and finally move from a human presence to colonization. Ultimately, this will set the conditions for an even farther stage of interstellar exploration and expansion.

The Moon is a stepping stone to the future, but Mars will be an important next objective as it has comparatively more to offer for human colonization.

The Moon is a stepping stone to the future, but Mars will be an important next objective as it has comparatively more to offer for human colonization. Solar energy can generate power on the Moon and Mars, but Mars has the possibility of wind power and has greater ability to support agriculture and create a more "indigenous" civilization than does the Moon. Mars has the

potential for rich and profitable mineral supplies, especially Deuterium—a fundamental element for nuclear power, particularly with the promise of fusion. Furthermore, there is today a discussion about “terraforming” the environment to eventually make it possible to create a stable civilization on a place like Mars, which scientists think could be rich in nitrogen, hydrogen, carbon, copper, sulfur, water, and ice. The NASA Gateway project and the Trump Moon-Mars Development project provide early glimpses into the possibilities that an economic zone that encompasses Mars has to offer.⁴ The Triplanetary project will be the launchpad to a permanent human presence in this arena and beyond.

invests in new seapower capabilities would therefore inevitably dominate the globe. The ingenuity and power of the aircraft carrier subsequently fulfilled Mahan’s prediction, ushering an era of American maritime—and ultimately global—dominance.

Will America lead in space, where it can create and facilitate a new economic revolution, bolster the democratic international order, and dominate the next great battlefield? Or will it cede that advantage to others, with potentially ruinous consequences for American primacy and global stability?

HIGH STAKES

Throughout their existence, nations encounter pivot points – moments where they can choose between disaster and surrender or triumph and victory. A failure to expend the needed time and resources to plan for the future can lead to military disasters, and even to civilizational downfall. History is rife with such examples: Athens during the Peloponnesian Wars (404 BC), the Roman Empire in 476 AD, China in the 19th century (which suffered three stunning military defeats, in 1842, 1860, and 1895), France in 1940, and so on. In each case, there was a failure to appreciate the technological and strategic advancements that no longer conformed to past doctrine. History is littered with those who lacked the requisite foresight and imagination to properly adapt and seize the moment.

America is no different. In 1897, the famed officer and strategist Alfred Thayer Mahan took note of the last time the United States faced such a challenge—with the inception of what is now the U.S. Navy. He wrote: “Those who hold that our political interests are confined to matters within our borders, and are unwilling to admit that circumstances may compel us in the future to political action without them, look with dislike and suspicion upon the growth of a body [the navy] whose very existence indicates that nations have international duties as well as international rights, and that international complications will arise from which we can no more escape than the states which have preceded us in history or those contemporary with us.”⁵ Mahan was warning that the high seas had increasingly opened new vistas for commerce and communication, and the nation that

The United States faces the same need to innovate again today. For policymakers, this imperative presents simple yet weighty choices: will America lead in space, where it can create and facilitate a new economic revolution, bolster the democratic international order, and dominate the next great battlefield? Or will it cede that advantage to others, with potentially ruinous consequences for American primacy and global stability?

Whether Washington likes it or not, a scramble for space is inevitable, and in fact is already well underway. Today, both Russia and China have surpassed the U.S. in the military space sector, as well as in the development of civilian space. Their innovations include China’s proposed work in Space-Based Solar Power (SBSP) and testing of anti-satellite weapons, as well as Russia’s advancement of hypersonic missiles. China intends to build space vessels that utilize nuclear propulsion, colonize the moon, and potentially create areas of anti-access and area denial in space. This activity belies the geopolitical imperative of primacy, now playing out in a new strategic domain.

Notably, Russia and China have been quite open about their ambitions. Both countries have recognized that nations that dominate space will end up dominating the globe. These nations are now angling for space dominance, and for good reason. The civilization that is the first to establish a durable presence in space will have the most vibrant and dynamic economy, the most advanced, high-paying jobs, and a technological edge that is second to none. Moreover, the potential for adversaries to put offensive weapons in space will blunt current American military superiority. U.S. aircraft

carriers and land-based missiles will simply become convenient targets. China or Russia's ability to dominate either energy or communication will make other nations into technological vassal states. As such, nothing short of America's current superpower status is at stake.

In order for the United States to maintain its position of primacy, the country must embrace a reinvigorated space strategy. America will need to progress beyond a mere space program, and lead a new military, economic and scientific revolution that will determine mankind's destiny. The stakes here are high; the nation that achieves space dominance will win future military conflicts. The 5000-year evolution and history of military technology have confirmed this trajectory.

and Luna's gravitational force.

4. Newt Gingrich, "Trump's plan to develop the moon and mars will change the future of the human race," *Newsweek*, July 23, 2019, <https://www.newsweek.com/trumps-plan-develop-moon-mars-will-change-future-human-race-opinion-1450736>
5. Alfred Thayer Mahan, *The Interest of America in Sea Power, Present and Future*, (originally published 1897).

ENDNOTES

1. NASA Gateway Project, <https://www.nasa.gov/topics/moon-to-mars/lunar-gateway>; "NASA's Lunar Outpost will Extend Human Presence in Deep Space," May 2, 2018, <https://www.nasa.gov/feature/nasa-s-lunar-outpost-will-extend-human-presence-in-deep-space>
2. "Space: Investing in the Final Frontier," Morgan Stanley, July 2, 2019, <https://www.morganstanley.com/ideas/investing-in-space>; Also see, Brian Higginbotham, "The Space Economy: An Industry Takes Off, U.S. Chamber of Commerce, October 11, 2018, <https://www.uschamber.com/series/above-the-fold/the-space-economy-industry-takes>
3. Objects in Low Earth Orbit (LEO) travel between 99 and 1200 miles above the surface of the Earth and have an orbital period (the time it takes for the object to orbit the Earth of between 88 and 127 minutes). LEO is where the majority of manmade space technology currently exists, such as the International Space Station. Geosynchronous Equatorial Orbit (GEO) is where objects are in high orbit above 22,000 miles match Earth's rotation (24 hours), which is useful for communications and surveillance satellites. Cislunar space is the space between the Earth's atmosphere and the area right beyond the orbit of the Moon. Strategically, cislunar includes the Lagrange points, which are the points in space where there is an equilibrium between Earth's

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A revolution is taking place in the nature of warfare. The proliferation of ballistic missiles and weapons of mass destruction has given rogue states and terrorist groups unprecedented access to potentially devastating capabilities, while space and cyberspace have emerged as distinct new arenas of strategic competition. The American Foreign Policy Council's (AFPC) work in these areas is aimed at helping U.S. officials understand and respond to this new, and increasingly complex, threat environment.

For more information about the program, please contact Richard Harrison, Director of Operations and Defense Technology Programs at Harrison@afpc.org.

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