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China's Space Power

Major Bryan Becker

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Exercise Solo Flight

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Introduction

In the past two decades, the world has seen a perpetual shift in the geopolitical landscape due to the rise of China. What was once a unipolar world dominated by the United States (U.S.) has become more multipolar, with China and others beginning to challenge the United States. As the current U.S. Administration published in the Interim National Security Strategic Guidance:

> The distribution of power worldwide is changing, creating new threats. China, in particular, has rapidly become more assertive. It is the only competitor potentially capable of combining its economic, diplomatic, military, and technological power to mount a sustained challenge. [1]

While China's most significant changes came in terms of rapid economic growth and regional diplomacy, there has been a substantial shift in military modernization, which is emphasized by a continual rise in military spending, estimated at roughly $229 Billion (USD) in the fiscal year 2021.[2] One specific area that continues to rise is spending on space technology development, which had a budget of $8.9 Billion (USD) in 2020, the second-most of any country, only behind the United States.[3] Chinese President Xi Jinping has made their intention and reasoning clear;

> Space dream is an important part of the Nation Strengthening dream. he field of space technology is a field of high technology concentration. The level of space technology is an important symbol of a country's scientific and technological strength and an important symbol of a country's economic strength, comprehensive national strength, and national defense strength.[4]

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[1] Joseph R Biden, "Interim National Security Strategic Guidance," The White House (The United States Government, March 3, 2021), https://www.whitehouse.gov/briefing-room/statements-releases/2021/03/03/interim-national-security-strategic-guidance/, 7-8.
[2] Associated Press, "China to Raise Defense Spending by 7.1% to $229 Billion," AP NEWS (Associated Press, March 5, 2022), https://apnews.com/article/business-china-congress-d03b477b646b055241e7712f86bacee6.
[3] Vyte Klisauskaite, "The Space Race: China's Ambitious Plans in Cosmos," AeroTime Hub, May 7, 2021, https://www.aerotime.aero/articles/27865-China-ambitious-space-plans.
[4] Jin Jiaxu, "Xi Jinping's 'Spaceflight Love,'" Xinhuanet, April 12, 2021, http://www.xinhuanet.com/politics/xxjxs/2021-04/12/c_1127322037.htm.

This statement by President Xi Jinping links the space domain and industry directly to instruments of national power, which include diplomacy, informational, military, and economic. The instruments of national power are tools applied by nations to increase their influence and power to achieve the desired outcome or end state. [5] This paper aims to answer if space is a critical environment for China to alter the geopolitical landscape?

The growing reliance on space capabilities and the commercialization of space has connected the domain to the instruments of national power more than ever before. Furthermore, space is an arena ripe for power exploitation. China's space industry, both military and civil sectors, is a threat to the U.S. and the domain is a critical environment for China to alter the geopolitical landscape in the ongoing great power competition between them and the U.S. To this end, the paper will analyze three sub-questions to determine if space is a critical domain to alter the geopolitical landscape. First, has the space domain historically been an environment for geopolitical competition, and is it still capable of altering the world order today? Second, is the evolution of the Chinese space capabilities a threat to the United States? Lastly, can China use the space domain to assert power? Using these three questions as the fundamental guidelines, this paper will ultimately lead to China's space industry being a threat, and critical for China to show the international community that it is more powerful than the United States.

[5] Canada. Department of National Defence. CFJP 3.0, Operations. Ottawa: Joint Doctrine Branch, 2009, 2-1 to 2-16. https://publications.gc.ca/collections/collection_2010/forces/D2-252-2009-eng.pdf. 2-1.

The Evolution and Resurgence: National Space Programs Translate to Geopolitical Power

In recent years, the world has seen a resurgence in the importance of the space domain. Many space professionals have declared that China and the U.S. are entering a second space race, as we saw during the Cold War between the U.S. and Russia. So, what is the difference today? And why is space a crucial arena for the power competition between the U.S. and China? Victoria Samson summarizes it, "space has always been a place for geopolitical competition. Even from the beginning of the Space Age, programs and goals were largely spurred by Cold War rivalry. This is not new; what has changed now is the role space plays: it truly is a key national security enabler."[6]

The theory of space being a feasible domain was limited by the ability to get there. The origins of the space age pre-dated the Cold War and came to fruition through the dreams of three prominent rocket pioneers: Russian Konstantin Tsiolkovsky, German-Romanian Hermann Oberth, and American Robert Goddard.[7] The earliest idea of artificial satellites was published in 1895 by Russian Konstantin Tsiolkovsky5.[8] However, the Soviet Union's (U.S.S.R.) launch of Sputnik didn't happen until 1957 and is the event that triggered the Space Race with the U.S.[9] At first, the U.S.S.R. stunned the world with many other firsts, such as Yuri Gagarin's spaceflight. To such an extent,

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[6] Victoria Samson, "The Geopolitics of a New Modern Space Race," Institute Montaigne (Institute Montaigne, December 9, 2021), https://www.institutmontaigne.org/en/blog/geopolitics-new-modern-space-race.
[7] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership*, Third (Peterson Air Force Base, CO: Air Force Space Command in association with Air University Press, 2011), https://www.airuniversity.af.edu/Portals/10/AUPress/Books/B_0063_SPIRES_BRADLEY_STURDEVANT_ECKERT_BEYOND_HORIZONS.pdf, 5.
[8] Ibid
[9] NASA History Division, "Sputnik and the Dawn of the Space Age," NASA (NASA), accessed April 20, 2022, https://history.nasa.gov/sputnik.html.

critics of the Eisenhower administration insisted that it allowed the U.S. to be embarrassed by not appreciating the political and psychological significance of being first in space.[10]

During the space race, the U.S. decided to keep much of its space program and technological advancement secret until the 1960s, eventually leading to the delivery of the final blow in 1969 with the moon landing.[11] There were ebbs and flows, until the eventual fall of the U.S.S.R., in terms of space superiority throughout the 1970s and 1980s, but the U.S. never relinquished its advantage. As the author of Arms Control in Space: Exploring Conditions for Preventive Arms Control, Max Mutschler points out:

> since the advancement of technology made space explorable, space has been linked to national and international politics. Against the background of the Cold War, space became another area in which the superpowers' rivalry was carried out. For both the Soviet Union and the U.S., their space programs were a means of demonstrating the superiority of their respective social systems.[12]

The transition from post-World War II to the Cold War was viewed as a bipolar situation featuring two superpowers, the U.S. and the U.S.S.R., a competition of political, ideological, and military power throughout multiple domains.[13] The Cold War, specifically the space race, can be classified as a battle for prestige where each nation looked to establish superiority over the other, eventually translating into power for one country.[14]

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[10] Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership*, 28.
[11] James Moltz, "The Changing Dynamics of Twenty-First-Century Space Power," *Journal of Strategic Security* 12, no. 1 (2019): pp. 15-43, https://doi.org/10.5038/1944-0472.12.1.1729, 18.
[12] Max Markus Mutschler, "Introduction," in *Arms Control in Space: Exploring Conditions for Preventive Arms Control* (New York: Palgrave Macmillan, 2013), pp. 1-15, 1.
[13] Ronald O'Rourke, "Renewed Great Power Competition: Implications for Defense-Issues for Congress," Congressional Research Service (Congressional Research Service, March 10, 2022), https://sgp.fas.org/crs/natsec/R43838.pdf, 29.
[14] Yuen Fong Khong, "Power as Prestige in World Politics," International Affairs 95, no. 1 (January 2019): pp. 119-142, https://doi.org/10.1093/ia/iiy245.

Subsequently, with the fall of the U.S.S.R. and the end of the Cold War U.S. saw what Ronald O'Rourke described as an

> The post-Cold War era was a unipolar situation, with the U.S. as the world's sole superpower. Neither Russia, China, nor any other country was viewed as posing a significant challenge to the United States' status as the world's sole superpower or the U.S.-led international order.[15]

In addition, they saw a period of hegemony in terms of Space power. During this time, the U.S. would demonstrate that the application of space assets could enhance military effectiveness during Desert Storm in 1991, largely considered the first space war.[16] They would again display space capabilities, as a military force enabler, in 1999, 2001, and 2003.[17] The international community took notice of this application of space power and the national security implications that arose from it.

As for the reaction, Chinese military authorities and the People's Liberation Army examine the use of space assets as a force enabler to the conduct of modern warfare.[18] As for Russia, Vladimir Putin took action to rebuild its space program recognizing the military vulnerability Russia faced and its historical significance of international prestige.[19] The direct consequences of these observations have led us to where we are today in that, through the national security lens, space is no longer a benign environment; it's a domain that needs to be secured to protect the interest of the nation. Furthermore, while countries look to pursue space for national security, a new trend emerged: the

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[15] O'Rourke, "Renewed Great Power Competition…, 29.
[16] Peter Anson and Dennis Cummings, "The First Space War: The Contribution of Satellites to the Gulf War," The RUSI Journal 136, no. 4 (March 20, 2008): pp. 45-53, https://doi.org/10.1080/03071849108445553, 53.
[17] Robert Farley, "Managing the Military Problem of Space: The Case of China, Part 1," The Diplomat (The Diplomat, May 22, 2021), https://thediplomat.com/2021/05/managing-the-military-problem-of-space-the-case-of-china-part-1/.
[18] Ibid.
[19] Moltz, The Changing Dynamics of Twenty-First-Century Space Power, 23.

commercialization and integration of space into our daily lives. Commercial activity in space has grown tremendously; it has grown from $100 billion in 2005 to $357 billion in 2020, and Morgan Stanley project that by 2040 the global space economy will be more than $1 trillion.[20] When considering these two motives, economic and military, it is evident why the resurgence of the space domain is a critical arena in the great power competition. The space domain is still a battle of national prestige, as in the Cold War, but due to the proliferation and connection of the global way of life, it is now also significantly associated with all national power instruments more than ever before.

The Response: The Rise of China's Space Power and Seizing the Opportunity

After determining that space has always been a domain of Geopolitical interests, it is critical to understand how China's space program has risen and how it will continue for militarily and civil uses. China's national space program comes from humble beginnings that have progressed slowly over time compared to the other space-capable nations, such as the U.S. and the U.S.S.R. or Russia, which benefited primarily through the Cold War space race competition. Now powered by one of the fastest-growing economies, China has set its space ambitions incredibly high; Chinese President Xi Jinping set aspirations for the Chinese space program to become the world leader in space power by 2045.[21] Thus, China will continue to challenge the U.S. in multiple areas. Still,

[20] Svetla Ben-Itzhak, "Analysis | Companies Are Commercializing Outer Space. Do Government Programs Still Matter?," The Washington Post (WP Company, January 11, 2022), https://www.washingtonpost.com/politics/2022/01/11/companies-are-commercializing-outer-space-do-government-programs-still-matter/.
[21] Jared Thompson, "Op-Ed: Beijing's Troubling Space Ambitions," SpaceNews (SpaceNews, May 20, 2021), https://spacenews.com/op-ed-beijings-troubling-space-ambitions/.

one of the most significant domains will be space due to its political, economic, and national security ramifications.

The ambitions of a Chinese space program pre-date the launch of Sputnik, but its origins can be directly traced back to two significant events. In January 1956, when Mao Zedong, former President of the People's Republic of China, called for a national drive to upgrade China's scientific capability.[22] The second event was a proposal by Dr. Qian Xucsen, a former Manhatten Project scientist stripped of his security clearance and deported from the U.S. because of his ties to a declared communist country.[23] Dr. Qian proposed establishing China's Defense Aviation Industry, which eventually led him to be known as the father of China's missile and space program.[24] In April of 1970, China launched the Dong Fang Hong satellite, entering the space age.[25]

The early years of the Chinese space program should be considered one of resilience due to overcoming many social and technical obstacles. It survived due to key political supporters understanding that the space program represented China's scientific and technological capabilities.[26] In the mid-1980s, the 30-year investment of the Long March Rocket paid off as the Challenger accident and a series of Ariance launch failures opened an opportunity for China to enter the commercialized space industry as a launch provider.[27] China's early success led to a cooperation agreement with the U.S. that eventually allowed them to launch 26 U.S. commercial Satellites, which ultimately ended

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[22] Yanping Chen, "China's Space Policy-A Historical Review," Space Policy 37 (2016): pp. 171-178, https://doi.org/10.1016/j.spacepol.2016.12.001, 172.
[23] BBC News, "Qian Xuesen: The Man the US Deported - Who Then Helped China into Space," BBC News (BBC, October 27, 2020), https://www.bbc.com/news/stories-54695598.
[24] Yanping Chen, China's Space Policy-A Historical Review, 172.
[25] David williams, "Dong Fang Hong - Red Is Eas," NASA Space Data Coordinated Archive (NASA), accessed May 1, 2022, https://nssdc.gsfc.nasa.gov/nmc/spacecraft/display.action?id=1967-066D.
[26] Ibid., 176.
[27] Ibid., 177.

due to a congressional investigation in 1999 for the transferring of sensitive information.[28] While the commercial launch revenue dramatically decreased, the importance of the space program did not; as previously mentioned, China was observing the significance of space capabilities during modern warfare by the U.S. during the 1990s and early-2000s.

The golden age of the Chinese space program started in the early-2000s and continues into today with a long list of accomplishments and goals, both in the military and civil spheres. At the same time, these spheres are hard to distinguish because most of the Chinese space program is state-run and militarily controlled.[29] James Moltz stated that the Chinese space program "has risen the fastest and farthest among major spacefaring countries over the past two decades and seems likely to continue on this trajectory."[30] How fast are they moving? To put it in perspective, Alexander Bowe stated in his 2019 report to U.S. Congress:

> China launched its first crewed spaceflight mission in 2003, but only eight years later launched its first temporary Tiangong space lab in 2011. If plans hold to launch its first long-term space station module, Tianhe-1, in 2020**,** it will have matched NASA's nearly 40-year progression from the first human spaceflight to the first space station module in less than 20 years.[31]

Since Bowe's report was published, there have been delays pushing completion to 2022.[32] However, the expediency and importance of such an accomplishment have not been lost.

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[28] Moltz, "The Changing Dynamics of Twenty-First-Century Space Power, 21.
[29] Ibid., 34
[30] Ibid., 34
[31] Alexander Bowe, "China's Pursuit of Space Power Status and Implications for the United States," China's Pursuit of Space Power Status and Implications for the United States (2019), https://www.uscc.gov/sites/default/files/Research/USCC_China%27s%20Space%20Power%20Goals.pdf, 12.
[32] Andrew Jones, "China's Tiangong Space Station," Space.com Future US Inc , August 24, 2021), https://www.space.com/tiangong-space-station.

The recently appointed U.S. Secretary of Defense Lloyd J. Austin II acknowledged this during his appointment hearing "the space domain is central to great power competition, and China is the pacing threat."[33]

As of 2015, The People's Liberation Army (PLA) established the Strategic Support Force (SSF), responsible for the military's space warfare missions.[34] The SSF, alongside the Central Military Commission Equipment Development Department (EDD), both organizations have tremendous oversight over the space program; presumably, many space assets have the capability for dual-use.[35] This strategic alignment of its space program set the foundation to move even quicker. In recent years, the list of growing accomplishments includes: “landing a rover on the far side of the Moon (2019), bringing back lunar samples to Earth (2020), completing the 30 satellite global navigation system Beidou (2020), and sending an uncrewed mission to Mars (2021).”[36] Additionally, the Chinese government recently published a white paper titled China's Space Program: a 2021 Perspective that lays out a detailed plan to establish itself as the leader in space.[37] This white paper set key milestones for each of the following goals: continue to develop and enhance on-orbit capabilities such as remote-sensing satellites, communications and broadcasting satellites, navigation satellites, continue R&D for lunar and planetary

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[33] Lloyd J. Austin, “Senate Armed Services Committee Advance Policy Questions for Lloyd J. Austin Nominee for Appointment to Be Secretary of Defense,” Senate Armed Services Committee (Senate Armed Services Committee, January 19, 21AD), https://www.armed-services.senate.gov/imo/media/doc/Austin_APQs_01-19-21.pdf, 56.
[34] Bowe, China’s Pursuit of Space Power Status and Implications for the United States, 4.
[35] Ibid, 4.
[36] Rajeswari Pillai Rajagopalan, “Will China's Tall Space Goals Spur Further Competition?,” The Diplomat (The Diplomat, February 9, 2022), https://thediplomat.com/2022/02/will-chinas-tall-space-goals-spur-further-competition/
[37] The State Council Information Office of the People's Republic of China, “China's Space Program: A 2021 Perspective,” China's space program: A 2021 perspective (The State Council Information Office of the People's Republic of China, January 28, 2022), http://www.cnsa.gov.cn/english/n6465652/n6465653/c6813088/content.html.

exploration, expand its commercial space industry, enhance space monitoring systems, and strengthen international cooperation.[38] With these goals and milestones, China's rapid development of space power will continue because it directly translates into the ability to create influence and power within the international community, both regionally and globally.

The Concern: China's Ability to Translate Space Power into Global Power

Since the dawn of the space age, the space domain has been a significant arena for power competition between nations. However, during the Cold War, it was a competition of prestige and political ideologies. While those remain constant today, the space domain is now, and in the future, more inextricably intertwined with every instrument of national power than ever before. For that very reason, China will use its space program as a critical apparatus to influence its geopolitical interests of unseating the United States at the top of the international hierarchy. Alexander Bowe's 2019 report emphasized this point:

> Compared to the U.S. space program, China's program is also more connected to the "levers of power," meaning its goals more often draw support from top leaders and are interconnected with the overall priorities of China's industrial and foreign policies. China's deliberate and comprehensive approach to its space program allows it to derive important economic, political, and diplomatic benefits, including domestic legitimacy and international prestige.[39]

The U.S. Joint Publication defines the diplomatic instrument "as engaging with other states or foreign groups to advance one's values, interests, and objectives and solicit

[38] Ibid.
[39] Bowe, China's Pursuit of Space Power Status and Implications for the United States, 3.

foreign support."[40] In 2008, China established the Asia-Pacific Space Cooperation Organization (APSCO); "APSCO is a cooperative mechanism for developing spacefaring nations by resource sharing in space science, space technology, and space application for its seven members: Bangladesh, China, Iran, Mongolia, Pakistan, Peru, Thailand, and Turkey."[41] As stated in the 2019 Report to Congress: "APSCO is its primary vehicle for international space cooperation; in return, China gains international prestige, promotes the export of its technology and services, and gains access to supplementary data."[42] APSCO is only one of the entities it uses to increase diplomatic power within the space community. The other mechanisms include cooperation agreements and leveraging sales from its commercial industry. China has current cooperation agreements which allow China to operate satellite tracking stations in Chile, Sweden, Australia, Namibia, Pakistan, Kenya, and Argentina. In addition, (see TABLE 1), there are twelve additional countries that China has either built a satellite for, launched the nation's satellite, or

[40] The United States Department of Defense, "Joint Publication Doctrine of the Armed Force of the United States," Joint Chiefs of Staff, March 25, 2013, https://www.jcs.mil/Portals/36/Documents/Doctrine/pubs/jp1_ch1.pdf, I-12.
[41] Asia-Pacific Space Cooperation Organization, "About Asia-Pacific Space Cooperation Organization," Asia-Pacific Space Cooperation Organization, accessed April 28, 2022, http://www.apsco.int/html/comp1/content/WhatisAPSCO/2018-06-06/33-144-1.shtml.
[42] The U.S.-China Economic and Security Review Commission. "2019 Report to Congress of the U.S.-China Economic and Security Review Commission." U.S. 116th Congress, Nov. 2019.368.

assisted in financing the satellite.[43] These are just a few examples of how China has grown diplomatic relationships and international influence spawned by its space program.

Table 1: Satellite Launched from Foreign Customers by China 2007 to 2021

Country	Satellite	Buuilder	Launch	Cost (in Millions)	Funding
Nigeria	NigComSat-1	CGWIC	May-07	$300	China EXIM Bank
Venezuela	VeneSat-1/ Simon Bo	CGWIC	Oct-08	241	China
Pakistan	PakSat-1R	CGWIC	Aug-11	222	China EXIM Bank
Nigeria	NigCom- Sat-1R	CGWIC	Dec-11	300	Insurance from Nig- ComSat-1
Venezula	VRSS-1	CAST	Sep-12	Unknown	Unknown
Sri Lanka	Supreme- Sat-1/China- Sat 12	Thales Alenia Space	Nov-12	$100	Unknown
Bolivia	Túpac Ka- tari-1	CGWIC	Dec-13	302	85% from China Development Bank
Loas	Laosat-1	CGWIC	Nov-15	259	China EXIM Bank
Belarus	Belintersat-1	CGWIC	Jan-16	280.9	China EXIM Bank
Venezula	VRSS-2	CAST	Oct-17	Unknown	Unknown
Algeria	Alcomsat-1	CAST	Dec-17	250-300	Algerian Space Agency
Pakistan	PRSS-1	DFH Satellite Co. Ltd	Jul-18	200	70% Fianace by China
Pakistan	PakTES-1A	Pakistan Space and Upper Atmo- sphere Research Com- mission (SUPAR- CO)	Jul-18	Unknown	Unknown
France	CFOSAT	CAST and French National Centre for Space Studies	Oct-18	Unknown	Unknown
Saudi Arabia	SaudiSat 5A & SaudiSat 5B	King Ab- dulaziz City for Science and Technology	Oct-18	Unknown	Unknown
Thailand	Highthroughput satellite	CGWIC	Dec-18	208	Unknown
Argentina	90 microsats	Satellogic	late 2019	Unknown	Unknown
Indonesia	Palapa-N1/ Nusantara Satu-2	CGWIC	late 2019	220	Unknown
Nigeria	NigCom- Sat-2, Nig- comSat-3	CGWIC	2021	700	China EXIM Bank
Indonesia	PSN-7	CGWIC	2021	Unknown	Unknown

Another example that could translate to an increase in future international cooperation is the completion of the Tiangong space station, which China can present as an alternative to the U.S. governed International Space Station (ISS) to expand

[43] Ibid.,.374.
Note: TABLE 1 was recreated from The U.S.-China Economic and Security Review Commission. "2019 Report to Congress of the U.S.-China Economic and Security Review Commission." U.S. 116th Congress, Nov. 2019.374.

diplomatic ties.[44] The ISS has approved funding through 2024, but the Biden Administration has committed to continuing operation to 2030.[45] If funding doesn't continue or an alternative isn't developed, the Tiangong space station will become the only option, increasing China's influence and power on the global scientific space community. This can also have economic ramifications because China will set the entry price and a secondary effect of an increase in the prestige of their national space program by being the only one.

The recent expansion of the commercialized space industry has been the most significant change, allowing companies such as SpaceX, Blue Origin, China Aerospace Science and Technology Corp (CASC), China Great Wall Industry Corporation (CGWIC), and many others trying to benefit economically from the space domain. The main difference between U.S.-based space companies and Chinese companies is that the Chinese are government-owned and operated. In 2014, China introduced the concept of the Space Silk Road, part of its global Belt and Road Initiative strategy, "which aims at creating an entire range of space capabilities including satellites, launch services, and ground infrastructure and at supporting related industries and service providers going global."[46] China's goal is to provide a cheaper alternative is will be able to surpass the U.S. and other foreign options in the commercial launch and satellite industry.[47] China has proven the economic benefits viable (see TABLE 1) by building satellites, being a

[44] Mercy A. Kuo, "The Politics of China's Space Power," The Diplomat (for The Diplomat, June 14, 2021), https://thediplomat.com/2021/06/the-politics-of-chinas-space-power/.
[45] Peter Aitken, "US Commits to Support International Space Station through 2030," New York Post (New York Post, January 3, 2022), https://nypost.com/2022/01/03/us-commits-to-support-international-space-station-through-2030/.
[46] Sebastian Ibold, "China`s Space Silk Road," Belt and Road Initiative, June 14, 2018, https://www.beltroad-initiative.com/space-silk-road/.
[47] The U.S.-China Economic and Security Review Commission. "2019 Report to Congress..,372.

launch provider, and assisting developing nations in financing these capabilities.[48] Also, China is looking into the future economic potential of space mining and lunar and planetary research.

A central cog in the Space Silk Road initiative is the recently completed Global Navigation System BeiDou. At the same time, the significance might be lost on many because the U.S.'s GPS, the EU's Galileo, and Russia's GLONASS have been around for some time. However, the economic development is quite significant; the global location-based services market is estimated to reach $239.7 billion (USD) by 2029.[49] China's market alone reached $33.24 billion (USD) in 2016.[50] This economic growth is primarily the export of BeiDou compatibility products for smartphones, vehicle-borne terminals, and wearable devices.[51] In addition, independent global navigation has diplomatic consequences regarding cooperation agreements (see TABLE 2).[52] Lastly, the completion

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[48] Ibid.,373.
[49] Meticulous Market Research Pvt. Ltd., "Location-Based Services (LBS) Market Worth $239.7 Billion by 2029 - Exclusive Report by Meticulous Research," GlobeNewswire News Room (Meticulous Market Research Pvt. Ltd., March 9, 2022), https://www.globenewswire.com/news-release/2022/03/09/2399941/0/en/Location-Based-Services-LBS-Market-Worth-239-7-Billion-by-2029-Exclusive-Report-by-Meticulous-Research.html.
[50] Ibold, "China`s Space Silk Road.
[51] Ibold, China`s Space Silk Road.
[52] Ibid.
Note: TABLE 2 was generated from data from Sebastian Ibold, "China`s Space Silk Road," Belt and Road Initiative, June 14, 2018, https://www.beltroad-initiative.com/space-silk-road/.

of the BeiDou constellation allows the Chinese military to expand its reach globally without relying on other nations' positioning systems.

TABLE 2: Silk Road Cooperation for BeiDou use as of 2018 **prior to completion

Country	Agreement
Algeria	Cooperation plan to apply BDS
Brunei	Application of BDS in smart city construction and tourism
Cambodia	Cooperation plan to apply BDS and satellite launch framework agreement
Egypt	Cooperation plan to apply BDS
Indonesia	Application of BDS in maritime positioning and navigation information
Laos	Application of BDS for precision agriculture
League of Arab State	Agreement to promote the use of BDS across the Middle East
Malaysia	Cooperation plan to apply BDS, BDS ASEAN Data and service center
Morocco	Cooperation plan to apply BDS
Myanmar	Application of BDS in land planning and channel supervision
Nigeria	Cooperation plan to apply BDS
Pakistin	Application of BDS in transport and port administration; Established regional Beidou Navigation Satellite system network
Russia	Plans to integrate BDS and GLONASS
Thailiand	BDS Continuously Operating Reference Stations (CORS); Plans for a China-ASEAN (BDS) science and technology city
Tunisia	First Chinese overseas BDS center established (China-Arab States BDS/GNSS Center)
Saudi-Arabia	Cooperation plan to apply BDS
Singapore	Cooperation plan to apply BDS
Sir Lanka	BDS Continuously Operating Reference Stations (CORS)
United Arab Emirate	Cooperation plan to apply BDS
U.S.	Joint Statement on Civil Signal Compatibility and Interoperability

As previously stated, since the Chinese space program is military-run, it should be assumed that most of the Silk Road initiative and other space ambitions can have a dual application. The PLA has developed and tested doctrinal concepts to implement for a peer-to-peer competition with the U.S. these concepts would destabilize the space domain

and decrease the U.S. reliance on space capabilities.[53] For example, in 2007, China successfully tested an anti-satellite missile (ASAT), destroying one of its satellites, demonstrating its ability to threaten space assets while leaving 2,300 pieces of debris that remain in orbit today.[54] In addition, in 2013, the satellite Shijan-12 successfully maneuvered and bumped it into another satellite, demonstrating the ability to impact other satellites intentionally.[55] Lastly, Todd Harrison 2022 Space Threat Assessment stated, "China has a growing suite of jamming and spoofing electronic warfare capabilities against space assets and is potentially developing non-kinect weapons such as laser or high-powered microwaves."[56] One other area of concern is the investment into their cyber warfare capabilities that could be directed toward the uplink and downlink of data from military satellites. PLA intends to create the longest stand of distance it can in case of a peer-to-peer conflict with the U.S. Their aggressive display of actions has been a cause of concern for the global community through the national security lens.

Conclusion

This paper identified that the space domain has always been an arena for great power competition. However, the increased ties between economic, diplomatic, and military instruments of power make it a significant arena for China to surpass and prove to the international community that they are the world's greatest superpower. It detailed the evolution of the Chinese space program and presented the future of aspirations to

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[53] The U.S.-China Economic and Security Review Commission. "2019 Report to Congress…,361.
[54] Thomas D Taverney, "Welcome to the New Space Race," Air Force Magazine, January 19, 2022, https://www.airforcemag.com/article/welcome-to-the-new-space-race/.
[55] Ibid.
[56] Todd Harrison et al., "Space Threat Assessment 2022," Center for Strategic and International Studies |, April 28, 2022, https://www.csis.org/, 10.

become the world's most prestige's. Lastly, it showed detailed examples of how China's space program is directly related to specific instruments of national power.

The renewal of great power competition between China and Russia is not a novel idea; it was mentioned in the previous U.S. Presidential administration's security documents and is broadcasted in the Biden administration.[57] One common area revealed in all these documents is they will challenge the U.S. in the space domain. While China is playing catch up, it is poised to unseat the U.S. unless it is met with a reaction. The first reaction was the U.S. creation of its sixth military branch, the U.S. Space Force, which will secure and defend its interest in the space domain from a national security lens.[58] While military power sends a straightforward message to the international community, commercialization and growing reliance on space have opened the economic and diplomatic instruments of power. The coming years will likely lead to a defining moment, as we saw during the first space race, but will that ultimately lead to a shift in the geopolitical order is remained to be seen.

[57] O'Rourke, "Renewed Great Power Competition…, 1.
[58] Farley, Managing the Military Problem of Space: The Case of China, Part 1.

Bibliography

Aitken, Peter. "U.S. Commits to Support International Space Station through 2030." New York Post. New York Post, January 3, 2022. https://nypost.com/2022/01/03/us-commits-to-support-international-space-station-through-2030/.

Anson, Peter, and Dennis Cummings. "The First Space War: The Contribution of Satellites to the Gulf War." *The RUSI Journal* 136, no. 4 (March 20, 2008): 45–53. https://doi.org/10.1080/03071849108445553.

Associated Press. "China to Raise Defense Spending by 7.1% to $229 Billion." AP NEWS. Associated Press, March 5, 2022. https://apnews.com/article/business-china-congress-d03b477b646b055241e7712f86bacee6.

Austin, Lloyd J. "Senate Armed Services Committee Advance Policy Questions for Lloyd J. Austin Nominee for Appointment to Be Secretary of Defense." Senate Armed Services Committee. Senate Armed Services Committee, January 19, 21AD. https://www.armed-services.senate.gov/imo/media/doc/Austin_APQs_01-19-21.pdf.

BBC News. "Qian Xuesen: The Man the U.S. Deported - Who Then Helped China into Space." BBC News. BBC, October 27, 2020. https://www.bbc.com/news/stories-54695598.

Ben-Itzhak, Svetla. "Analysis | Companies Are Commercializing Outer Space. Do Government Programs Still Matter?" The Washington Post. W.P. Company, January 11, 2022. https://www.washingtonpost.com/politics/2022/01/11/companies-are-commercializing-outer-space-do-government-programs-still-matter/.

Biden, Joseph R. "Interim National Security Strategic Guidance." The White House. The United States Government, March 3, 2021. https://www.whitehouse.gov/briefing-room/statements-releases/2021/03/03/interim-national-security-strategic-guidance/.

Canada. Department of National Defence. CFJP 3.0, Operations. Ottawa: Joint Doctrine Branch, 2009, 2-1 to 2-16. https://publications.gc.ca/collections/collection_2010/forces/D2-252-2009-eng.pdf.

Chen, Yanping. "China's Space Policy-A Historical Review." *Space Policy* 37 (2016): 171–78. https://doi.org/10.1016/j.spacepol.2016.12.001.

Erwin, Sandra. “Trump Signs Defense Bill Establishing U.S. Space Force: What Comes Next.” SpaceNews, December 21, 2019. https://spacenews.com/trump-signs-defense-bill-establishing-u-s-space-force-what-comes-next/.

Farley, Robert. "Managing the Military Problem of Space: The Case of China, Part 1." The Diplomat. The Diplomat, May 22, 2021.

https://thediplomat.com/2021/05/managing-the-military-problem-of-space-the-case-of-china-part-1/.

Funaiole, Matthew P, and Brian Hart. "China's New Space Station Is a Stepping-Stone to Achieving Broader Ambitions." Center for Strategic & International Studies. Center for Strategic & International Studies, April 29, 2021. https://www.csis.org/analysis/chinas-new-space-station-stepping-stone-achieving-broader-ambitions.

Harrison, Todd, Kaitlyn Johnson, Makena Young, Nicholas Wood, and Alyssa Goeller. "Space Threat Assessment 2022 ." Center for Strategic and International Studies |, April 28, 2022. https://www.csis.org/.

History.com Editors. “The Space Race.” History.com. A&E Television Networks, February 22, 2010. https://www.history.com/topics/cold-war/space-race.

Hong , Chan Min, and Jungsik Um. "U.S. Space Power Augmentation and Security Strategy against China." Korea Institute for Defense Analyses. Korea Institute for Defense Analyses, March 1, 2022. https://www.kida.re.kr/frt/board/frtNormalBoardDetail.do?sidx=707&idx=2619&depth=3&lang=en.

Ibold, Sebastian. "China's Space Silk Road." Belt and Road Initiative, June 14, 2018. https://www.beltroad-initiative.com/space-silk-road/.

Jones, Andrew. "China's Tiangong Space Station." Space.com. Future U.S. Inc, August 24, 2021. https://www.space.com/tiangong-space-station.

Khong, Yuen Foong. "Power as Prestige in World Politics." *International Affairs* 95, no. 1 (2019): 119–42. https://doi.org/10.1093/ia/iiy245.

Klisauskaite, Vyte. "The Space Race: China's Ambitious Plans in Cosmos." AeroTime Hub, May 7, 2021. https://www.aerotime.aero/articles/27865-China-ambitious-space-plans

Kuo, Mercy A. "The Politics of China's Space Power." The Diplomat. for The Diplomat, June 14, 2021. https://thediplomat.com/2021/06/the-politics-of-chinas-space-power/.

Moltz, James Clay. "The Changing Dynamics of Twenty-First-Century Space Power." *Journal of Strategic Security* 12, no. 1 (2019): 15–43. https://www.jstor.org/stable/26623076.

Mutschler, Max Markus. “Introduction .” Essay. In *Arms Control in Space: Exploring Conditions for Preventive Arms Control*, 1–15. New York: Palgrave Macmillan, 2013.

NASA History Division. "Sputnik and the Dawn of the Space Age." NASA. NASA. Accessed April 20, 2022. https://history.nasa.gov/sputnik.html.

O'Rourke, Ronald. "Renewed Great Power Competition: Implications for Defense-Issues for Congress." Congressional Research Service. Congressional Research Service, March 10, 2022. https://sgp.fas.org/crs/natsec/R43838.pdf.

Rajagopalan, Rajeswari Pillai. "Will China's Tall Space Goals Spur Further Competition?." The Diplomat. The Diplomat, February 9, 2022. https://thediplomat.com/2022/02/will-chinas-tall-space-goals-spur-further-competition/.

Samson, Victoria. "The Geopolitics of a New Modern Space Race." Institut Montaigne. Institut Montaigne, December 9, 2021. https://www.institutmontaigne.org/en/blog/geopolitics-new-modern-space-race.

Sauzay, Arthur. "Latest Space Race News." Institut Montaigne. Institut Montaigne, September 1, 2021. https://www.institutmontaigne.org/en/blog/latest-space-race-news.

Spires, David N. *Beyond Horizons: A Half Century of Air Force Space Leadership*. *Air University*. Thirded. Peterson Air Force Base, CO: Air Force Space Command in association with Air University Press, 2011. https://www.airuniversity.af.edu/Portals/10/AUPress/Books/B_0063_SPIRES_BRADLEY_STURDEVANT_ECKERT_BEYOND_HORIZONS.pdf.

Taverney, Thomas D. "Welcome to the New Space Race." Air Force Magazine, January 19, 2022. https://www.airforcemag.com/article/welcome-to-the-new-space-race/.

The State Council Information Office of the People's Republic of China. "China's Space Program: A 2021 Perspective." China's space program: A 2021 perspective. The State Council Information Office of the People's Republic of China, January 28, 2022. http://www.cnsa.gov.cn/english/n6465652/n6465653/c6813088/content.html.

The United States Department of Defense. "Joint Publication Doctrine of the Armed Forces of the United States ." Joint Chiefs of Staff, March 25, 2013. https://www.jcs.mil/Portals/36/Documents/Doctrine/pubs/jp1_ch1.pdf.

The U.S.-China Economic and Security Review Commission, and Alexander Bowe. Report, China's Pursuit of Space Power Status and Implications for the United States (2019). https://www.uscc.gov/sites/default/files/Research/USCC_China%27s%20Space%20Power%20Goals.pdf.

The U.S.-China Economic and Security Review Commission. "2019 Report to Congress of the U.S.-China Economic and Security Review Commission." U.S. 116th

Congress, Nov. 2019. pp.359-401. https://www.uscc.gov/sites/default/files/2019-11/2019%20Annual%20Report%20to%20Congress.pdf

Thompson, Jared. "Op-Ed: Beijing's Troubling Space Ambitions." SpaceNews. SpaceNews, May 20, 2021. https://spacenews.com/op-ed-beijings-troubling-space-ambitions/.

Williams, David. “Dong Fang Hong - Red Is Eas.” NASA Space Data Coordinated Archive. NASA. Accessed May 1, 2022. https://nssdc.gsfc.nasa.gov/nmc/spacecraft/display.action?id=1967-066D.