Statement before the

U.S.-China Economic and Security Review Commission

"China in Space: A Strategic Competition"

A Testimony by:

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April 25, 2019

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While China was not a significant space power throughout the first four decades of the space age, its space capabilities have significantly improved over the past twenty years. In the late 1990s, the United States adopted policies designed to thwart China's ability to access space-related technologies. China responded by accelerating the pace of its space programs. Over the past two decades, China has developed a human spaceflight program, launched and operated two rudimentary space stations, and, more recently, landed a lunar rover on the far side of the moon. Last year, China had more orbital space launches than any other country on Earth, with 38 successful launches compared to 34 for the United States and 19 for Russia.[1] China has quickly become a major player in the space domain and has made significant advances in both civil and national security space programs. While these two streams of effort often overlap with one another, the missions involved are sufficiently different to warrant separate and distinct approaches by the United States.

China's plans for civil space programs include building a new modular space station with an expected lifespan of ten years or longer.[2] It plans to build a space telescope with a field of view 300 times larger than the Hubble Space Telescope and with similar resolution. This telescope will be placed in orbit near the space station to facilitate easier servicing missions throughout the life of the instrument.[3] China is also estimated to spend about $11 billion annually on civil and military space-related programs, a sum that is second only to the United States.[4]

It should be noted, however, that China's recent achievements in human spaceflight, in operating rudimentary space stations, and in landing an un-crewed vehicle on the moon are milestones the United States first achieved in the 1960s and 1970s. While China has made advancements in space technology, it is still behind the United States in many areas. And much of what China has achieved has been in space programs that are not inherently military, although many of the component technologies can be dual-use.

Space diplomacy has been an important component of overall U.S. foreign policy for decades, and China may see similar potential in its burgeoning civil space program. Many nations view space capabilities as a source of national pride. Having a space program brings a certain level of diplomatic clout, and partnerships in space—or the prospect of potential partnerships—can be a significant lure for smaller or less technologically advanced countries that otherwise could not pursue space programs independently.

To emerge as a near-peer competitor to the United States and as a true global power, China is building a network of partnerships around the world, as is evident in its One Belt, One Road

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[1] Thomas Roberts, *Spaceports of the World* (Washington D.C.: Center for Strategic and International Studies, March 13, 2019).

[2] Ludovic Ehret, "China Unveils New 'Heavenly Palace' Space Station as ISS Days Numbered," *Phys.org*, November 6, 2018, https://phys.org/news/2018-11-china-unveils-heavenly-palace-space.html.

[3] Joan Johnson-Freese, "China Launched More Rockets into Orbit in 2018 than Any Other Country," *MIT Technology Review*, December 19, 2018, https://www.technologyreview.com/s/612595/china-launched-more-rockets-into-orbit-in-2018-than-any-other-country/.

[4] Bryce Space and Technology, LLC, *Global Space Industry Dynamics* (Alexandria, VA: Bryce Space and Technology, 2017), 3, https://brycetech.com/downloads/Global_Space_Industry_Dynamics_2017.pdf.

initiative.[5] Partnerships in space could be used as another lever to induce cooperation on Earth. More specifically, China could use the prospect of human spaceflight missions to its new space station, to the moon, and one day to Mars as an incentive for other countries to partner with it in ways that further its terrestrial ambitions.

In addition to its civil space programs, China is also advancing its military space capabilities. It is making rapid progress deploying its own *Beidou* constellation of satellites for positioning, navigation, and timing (PNT)—a rival to the U.S. Global Positioning System (GPS) which China claims will one day be more capable and accurate than the U.S. system. The *Beidou* constellation is expected to begin providing continuous global coverage sometime next year, and China has been offering access to *Beidou* as part of its One Belt, One Road initiative.[6] Since 2000, China has launched six new types of remote sensing satellites, with at least 76 operational remote sensing satellites on-orbit as of 2016. In addition, China has some 34 communications satellites on-orbit, at least three of which can be used to relay information from other satellites back to ground stations on Earth.[7]

To be clear, these space capabilities are not, in and of themselves, threatening or unusual. One should expect that a country with the second largest GDP in the world would possess such space systems. Moreover, many of the types of space systems China is developing to support its military are systems the United States has had for decades. While China does not appear to be pulling ahead of the United States in any of these technologies, it is nevertheless making progress.

What is most concerning, however, are the advances China is making in its counterspace programs. Counterspace systems are designed to disrupt, degrade, or destroy the space systems we have come to rely upon. The appropriate comparison in this dimension of the competition is not whether China has better counterspace systems than the United States' counterspace systems. Instead, what we should be comparing are China's advancements in developing counterspace systems relative to the United States' progress in deploying protections against these threats. And in this respect, China appears to be gaining advantage over the United States.

Since China's much derided anti-satellite (ASAT) test in 2007, it has continued to develop, test, and operationally deploy a wide range of counterspace systems. While it has not conducted a debris-producing test of its direct-ascent ASAT missiles since 2007, it has conducted additional tests—nearly one each year—that have demonstrated its ability to intercept satellites as high as geostationary orbit. With this capability, China can effectively hold all U.S. military satellites at risk.[8]

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[5] China Power Team, "How Will the Belt and Road Initiative Advance China's Interests?," *China Power*, May 8, 2017, updated September 11, 2017, https://chinapower.csis.org/china-belt-and-road-initiative/.

[6] SUN Degang & ZHANG Yuyou, "Building an 'Outer Space Silk Road': China's Beidou Navigation Satellite System in the Arab World," *Journal of Middle Eastern and Islamic Studies (in Asia),* Vol. 10, No. 3, 2016, https://www.tandfonline.com/doi/pdf/10.1080/19370679.2016.12023286.

[7] Kevin Pollpeter, Michael Chase, and Eric Heginbotham, *The Creation of the PLA Strategic Support Force and Its Implications for Chinese Military Space Operations* (Santa Monica, CA: RAND Corporation, 2017), 8.

[8] Todd Harrison, Kaitlyn Johnson, Thomas Roberts, et. al, *Space Threat Assessment 2019* (Washington, D.C.: Center for Strategic and International Studies, April 2019), 11, https://csis-prod.s3.amazonaws.com/s3fs-public/publication/190404_SpaceThreatAssessment_interior.pdf.

China's SJ-17 satellite has also attracted attention because of its potential use as a testbed for co-orbital ASAT technologies and operations. This satellite, launched in November 2016, has transited the geostationary belt in space, conducting several close approaches with other Chinese satellites.[9] China has previously tested other co-orbital systems, such as the Aolong-1, with robotic arms than can grapple and physically manipulate other satellites.[10] Importantly, this co-orbital technology is dual-use: it can be used for peaceful purposes, such as removing harmful orbital debris and repairing other satellites, or it can be used for counterspace activities, such as disabling other satellites. However, it does not appear that China has used its co-orbital capabilities for destructive purposes.

China has also developed a wide range of non-kinetic counterspace capabilities that can threaten U.S. economic and security interests in space. China reportedly tested a satellite lasing system by illuminating U.S. imagery satellites as they passed over Chinese territory in 2006.[11] This technology could be used to cause irreversible damage that would render the attacked satellites useless. China has demonstrated the ability to jam GPS signals and a variety of satellite communications bands, and it has expressed its intent in the past to use these non-kinetic counterspace capabilities to disrupt U.S. military drone operations in the South China Sea.[12] In April 2018, China followed through on this threat by placing what appears to be truck-mounted jamming systems on Mischief Reef in the Spratly Islands.[13]

These are just a few examples that highlight China's growing counterspace capabilities. China is developing, testing, and operationalizing counterspace weapons at a faster pace than we are making progress protecting our space systems against these threats. This is a competition we cannot afford to lose, and it is a situation that is at least partially of our own making because vulnerability invites aggression. Our slow pace in adapting to the growing threats to our space systems makes the prospect of conflict in space more likely because it incentivizes potential adversaries, like China, to challenge us militarily in space.

My central recommendation is that we need to rethink our approach to China when it comes to space. We need a multifaceted approach that simultaneously engages and deters. We should engage China proactively in civil space programs when we have shared goals and when our intellectual property and existing space partnerships are adequately protected. Our policy of excluding China from human spaceflight and exploration missions to the moon and beyond has not slowed its rise as a space power. Worse, it may create an incentive for China to build an alternative coalition for space exploration that could undermine the traditional American leadership role in this arena.

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[9] Colin Clark, "China Satellite SJ-17, Friendly Wanderer?" *Breaking Defense*, April 19,2018, https://breakingdefense.com/2018/04/china-satellite-sj-17-friendly-wanderer/.

[10] "China's new Orbital Debris Clean-Up Satellite raises Space Militarization Concerns," *Spaceflight 101*, June 29, 2016, http://spaceflight101.com/long-march-7-maiden-launch/aolong-1-asat-concerns/.

[11] Vago Muradian, "China Tried to Blind U.S. Sats with Laser," Defense News, September 25, 2006.

[12] Bill Gertz, "Inside the Ring: China targets Global Hawk drone," *Washington Times*, December 11, 2013, https://www.washingtontimes.com/news/2013/dec/11/inside-the-ring-china-targets-global-hawk-drone/.

[13] Michael R. Gordon and Jeremy Page, "China Installed Military Jamming Equipment on Spratly Islands, U.S. Says," *Wall Street Journal*, April 9, 2018, https://www.wsj.com/articles/china-installed-military-jamming-equipment-on-spratly-islands-u-s-says-1523266320.

As we engage China more openly in civil space, we should simultaneously make a concerted effort to improve our deterrence posture in national security space. Deterrence holds when an adversary believes the diplomatic, economic, and military costs of doing something exceed the likely benefits. The United States needs to take immediate steps to improve the protection of our systems against the types of counterspace threats China is developing and deploying. In some cases, this may be as simple as improving encryption and adopting satellite communications waveforms that are more resistant to jamming and spoofing. In other cases, it may require fielding entirely new space architectures that use a larger number of satellites in a variety of orbits rather than a small constellation of "big, fat, juicy targets."[14] Ultimately, to effectively deter conflict from extending into space we must credibly communicate that we are prepared to fight a conflict that extends into space. Today, we are not adequately prepared for such a conflict, and our lack of preparation undermines deterrence.

China is a rising space power. Our policies must recognize this fact and adapt accordingly to protect our economic and security interests in space. While engagement and deterrence may seem like contradictory approaches at first, it is a strategy that served us well throughout the Cold War. We routinely partnered with the Soviet Union on civil space programs, such as the Apollo-Soyuz Test Project, while simultaneously deterring the Soviets from attacking our critical space assets. A similar approach can be used with China to ease tensions, create new channels of communication, and dissuade dangerous developments in space.

[14] Sandra Erwin, "STRATCOM chief Hyten: 'I will not support buying big satellites that make juicy targets'," *Space News*, November 19, 2017, https://spacenews.com/stratcom-chief-hyten-i-will-not-support-buying-big-satellites-that-make-juicy-targets/.