



# Space Policy Review

## ***Thousand Sails: Why Low Earth Orbit is the Next Frontier for Great Power Competition between the U.S. and China***

*By: Sydney Nystrom, David Zou, and Peter Garretson*

### **The Big Picture**

- ◆ Qianfan (“Thousand Sails”) is one of several Chinese mega-constellations being erected by the People’s Republic of China to rival U.S.-based Starlink, with plans to grow to more than 14,000 satellites.
- ◆ Especially in places like Africa, Qianfan is poised to deliver digital connectivity to the continent’s population of 1.3 billion, which is currently only 40 percent wired—potentially allowing China to shape the hearts and minds of the developing world.
- ◆ A broadband network of Chinese satellites that allows for global command and control would greatly augment China’s military capabilities and put Beijing in a position to permit states to use the Chinese satellites for their benefit.
- ◆ Chinese researchers from the PLA’s Space Engineering University are planning satellites equipped with new AI weapons, including lasers and high-powered microwaves, developed to destroy Starlink satellites that pass over China and other sensitive regions.
- ◆ Policymakers in Washington need to focus on steps such as increased cooperation with allied space initiatives and expanded digital offerings to, and infrastructure development in, the Global South if they hope to seriously contest China’s growing foray into digital dominance.

On October 15th, less than two months after its first successful launch, China launched a second batch of 18 Qianfan satellites.<sup>1</sup>

What is Qianfan? Qianfan, or “Thousand Sails,” is a project of the Shanghai Spacecom Satellite Technology (SSST).<sup>2</sup> It is one of several Chinese mega-constellations being erected by the People’s Republic of China to rival U.S.-based Starlink, the digital connectivity startup of billionaire entrepreneur Elon Musk. Other Chinese initiatives in this arena include “Guo Wang” (“National Network”) and the “Hongyan Constellation.” The scope of these efforts is exceedingly ambitious. Guo Wang alone aims to provide broadband internet nation-wide and will comprise 13,000 satellites positioned at various levels in Low Earth Orbit (LEO). Qianfan is even more ambitious, intending to grow its constellation to more than 600 satellites by the end of 2025, and to eventually emplace 14,000 satellites into orbit.<sup>3</sup>

As a result, Qianfan’s recent launch successes have naturally reignited debate about the finite nature of real estate in LEO, which both the U.S. and China increasingly view as vital to their national economic and military interests.<sup>4</sup> The ramifications abound. As China rapidly expands this network of satellites, it grows in informational power. As a result, it could acquire a dominant position in global connectivity, greatly expanding the reach and impact of its messaging, propaganda and influence operations.

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## The Quest for Leo Dominance

Demand for LEO satellites has soared in recent years, dominating all other categories of satellites. According to Business Research Insights, a trade consultancy, the LEO satellite market is likely to grow from \$4 billion in 2022 to nearly \$7 billion by 2031.<sup>5</sup> China's successful October launch was a major milestone in this regard, marking a leap forward for China's space program and its LEO ambitions—and a growing threat to U.S. dominance in the space domain.

Qianfan, and the proliferation of Chinese satellite constellations more generally, has touched off an increasingly fierce battle over coveted orbital real estate in LEO. In light of Starlink's relative success, countries like China are racing to compete. As one recent article noted, "China plans to launch as many as 3,900 satellites into LEO by 2027, moving toward a larger ambition of having at least three mega constellations comprising over 10,000 satellites each."<sup>6</sup> This growth in satellite activity, and the intensifying nature of the U.S.-Chinese rivalry, could heighten the risk of accidents and even conflict in the future.

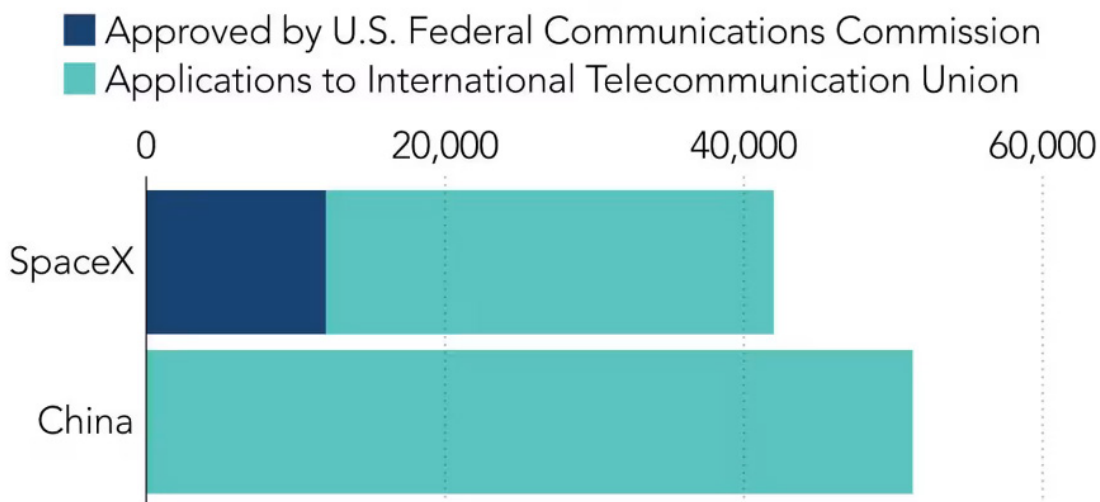
Furthermore, this state of affairs is exacerbated by the underdeveloped international "rules of the road" and space norms in LEO. Currently, states report their intentions and radio frequencies to the International Telecommunications Union (ITU), but the "real-estate" (the orbital shells occupied by such constellations in LEO) remains largely unregulated. This differs from the state of affairs in geosynchronous equatorial orbit (GEO), where the ITU is responsible for coordinating the allocation of different radio frequencies used by GEO satellites to prevent radio interference, assigning orbital "slots" to commercial entities and nations, and developing new telecommunications standards and guidelines. While that system is not perfect, the ITU has succeeded in creating an organized framework that prevents countries from arbitrarily abusing this space.

Not so in LEO, however. The absence of a similar authority to regulate orbital "real-estate" in LEO has emboldened China to deploy satellites like Qianfan and take advantage of this legal gray zone, staking claims on valuable orbital resources and leaving fewer "slots" for American and allied nation firms, potentially causing space traffic management concerns. For example,

**FIGURE 1: SpaceX's and China's astronomical ambitions<sup>7</sup>**

### SpaceX's and China's astronomical ambitions

*(Number of satellites planned under spectrum applications)*



*As of August 2024*

*Source: Media reports, senior engineer affiliated with China Aerospace Science and Technology Corp.*

since its first launch, Starlink has been forced to make adjustments to avoid space debris over 50,000 times.<sup>8</sup> Additionally, as a result of a lack of international space governance, Starlink and China continue to face miscommunications in space, resulting in potential satellite collisions.<sup>9</sup>

## Locking In Infrastructure Dependency

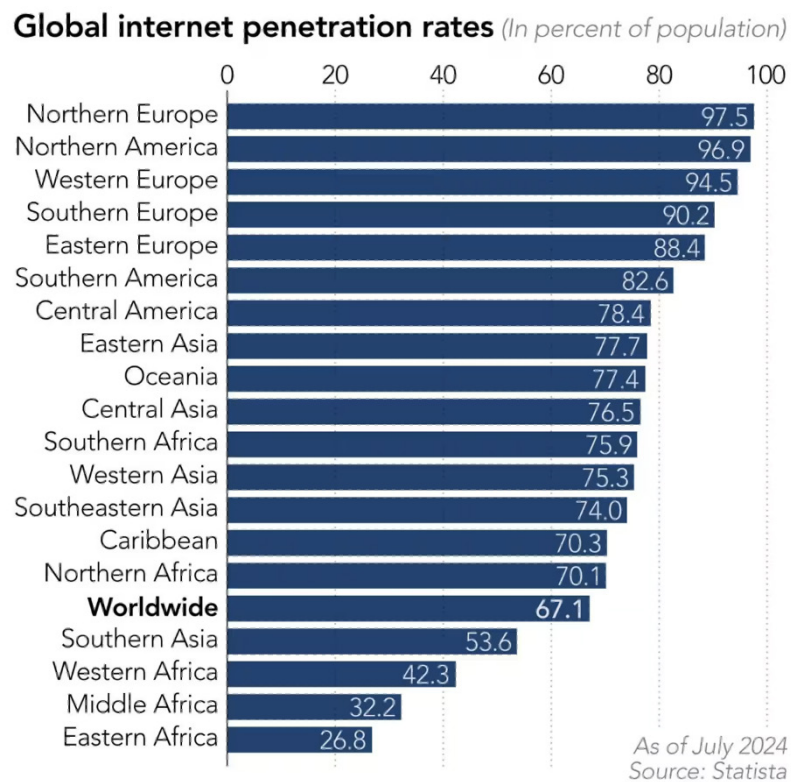
Qianfan is likewise crucial to China's Space Information Corridor, a component of the sprawling Belt & Road Initiative that has served as the centerpiece of CCP General Secretary Xi Jinping's foreign policy for the past decade. The Corridor aims to improve digital connectivity around the world through expanded cooperation on space-based technologies, information and technology sharing.<sup>10</sup> Especially in places like Africa, Qianfan is poised to deliver digital connectivity to the continent's population of 1.3 billion, which is currently only 40 percent wired.<sup>11</sup>

By meeting this demand, China could use its resulting clout to shape the hearts and minds of the developing world and therefore gain far greater political influence.

Another goal of the BRI's Space Information Corridor is to help key countries develop their own space capabilities, and China has provided these nations with critical support by sharing technical knowledge and allowing access to its launch sites. BRICS countries like South Africa have already signaled growing interest in closer space cooperation with China on a number of fronts, including infrastructure development and satellite launches, and have become increasingly reliant on China's space infrastructure. The results reflect growing Chinese dominance in shaping the space programs of nations on the African continent. Unlike China, however, the U.S. has not prioritized space cooperation with African countries to the same extent, thereby further eroding its authority and relevance in the region.<sup>12</sup>

But while the benefits that come with low cost Chinese technology and new infrastructure development are hard to overlook, they are offset by the "exorbitant replacement costs and a reliance on a small set of vendors, often SOEs that rate low on interoperability."<sup>13</sup> Many of

**FIGURE 2: Enabling Economic Development and Locking in Infrastructure Dependency<sup>14</sup>**

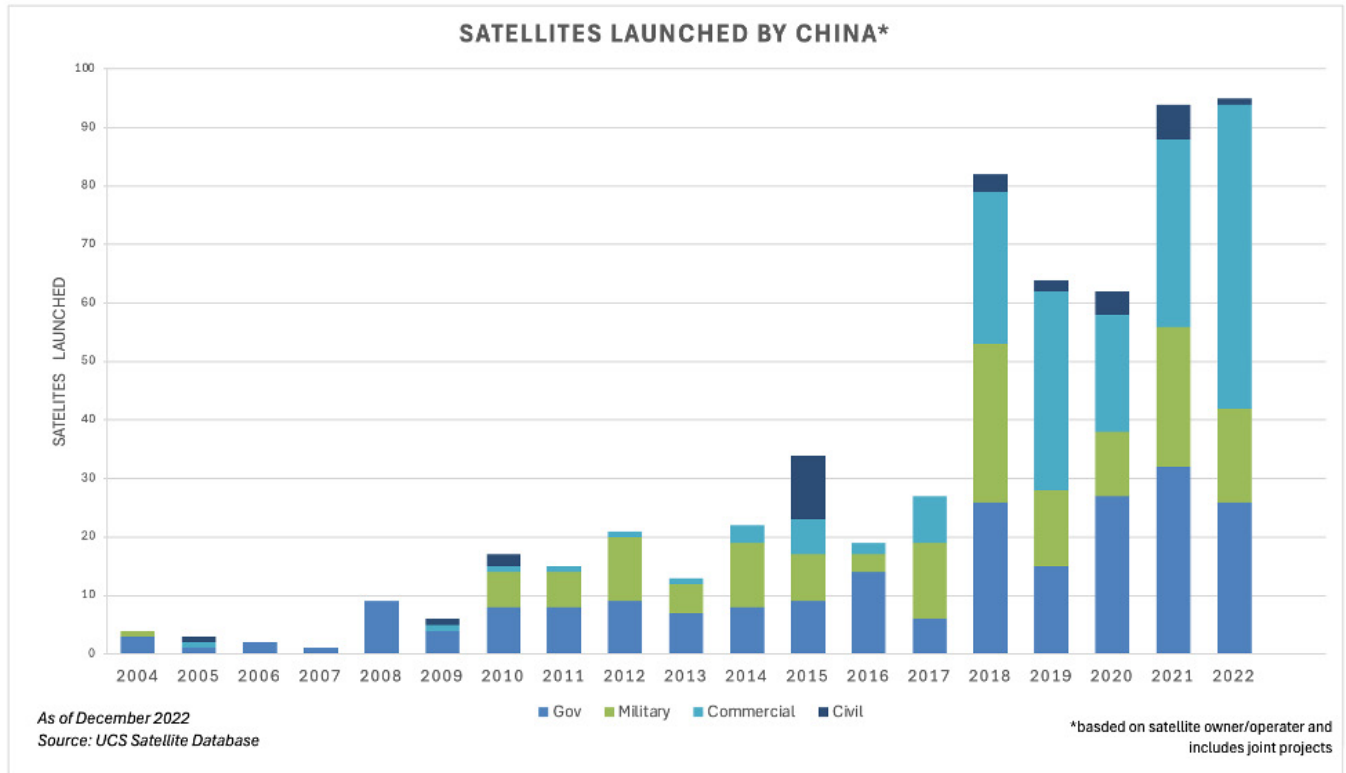


China's largest infrastructure development projects in the BRI receive funding from the Chinese government, including SSST, the company behind Qianfan. These monopolistic practices make it significantly harder for western companies to compete with China for access to emerging markets. The end result has been growing infrastructure dependency, which paves the way for China to expand its geopolitical influence in Africa at the expense of U.S. regional interests.

## Amplifying Propaganda and Political Warfare

It's no secret that the PRC has been attempting to influence the digital sphere with its authoritarian surveillance tactics for years. China has even been named the world's "worst abuser of internet freedom" by democracy watchdog Freedom House.<sup>15</sup> The launch of China's new satellites could expand its ability to impose these tactics on users around the globe. Qianfan satellites have the potential to allow China to strengthen authoritarian governments, disseminate pro-CCP propaganda, and undermine U.S. messaging efforts.<sup>16</sup>



**FIGURE 3: Chinese Satellite Launches**

More specifically, how China uses the internet is fundamentally different from the Western approach, with Beijing seeing the digital domain as key to “national security and sovereignty”<sup>17</sup> rather than a tool for free-thinking. Embedded in this conception is the use of the internet for what Chinese experts have termed “cognitive warfare,” to shape the minds of its users through political propaganda. “The Chinese government is employing tactics that seek to influence lawmakers and public opinion to achieve policies that are more favorable to China,” the FBI has warned.<sup>18</sup> Even more alarmingly, China is also expanding its information warfare campaign across the globe, with the potential to “reshape the global information landscape, creating biases and gaps that could even lead nations to make decisions that subordinate their economic and security interests to Beijing’s.”<sup>19</sup>

In line with its view of the digital sphere as a battleground, China’s government has employed various strategies to ensure cyber-dominance through a variety of methods, including information manipulation and disinformation. These efforts, in turn, may be amplified by the new reach and platforms provided by expanded

space internet delivery. As a result, China would hold growing power to destabilize or undermine existing legitimate governments. It could also help Beijing establish new, or augment existing, “covert groups within a nation engaged in espionage, sabotage, or subversion to undermine national stability and aid external enemies.”<sup>21</sup>

Here, Africa again provides a case in point. Qianfan has the potential to supercharge China’s propaganda efforts on the continent, and—crucially—create a “captive audience” that would be reliant on Chinese messaging to inform its view of the world. It should go without saying that, given the current state of Sino-American relations, a Chinese monopoly on “hearts and minds” on the African continent would be accompanied by messaging to cast the United States and its international partners in a profoundly negative light.

## Satellites and Chinese Military Strategy

Future warfare has been predicted by many to be dominated by long range missiles and drones,

technologies which require a reconnaissance capability in order to “sense and strike” an enemy’s critical infrastructure.<sup>22</sup> Accordingly, to maintain the upper hand during a long-range conflict, it is essential to have the technology to promptly detect where one can inflict damage on the enemy, be able to share that information with friendly military forces, and be able to command beyond-line-of-sight weapons. China already possesses one of the world’s largest and most advanced fleets of spy satellites.<sup>23</sup> Furthermore, as one assessment has noted, “since the inception of China’s military space arm in 2015, the country has seen a 550 percent increase in on-orbit assets”<sup>24</sup>—something that is a testament to Beijing’s enduring commitment to space supremacy.


A broadband network of Chinese satellites that allows for global command and control would greatly augment this capability, as well as put China in a position to permit states that otherwise may not have had this power to use the Chinese satellites for their benefit. This would make Beijing a critical strategic broker, giving it the power to choose which states it wants to have the upper hand in a long-range war and equipping them with the tools necessary for battlefield dominance.

Lastly, Qianfan would enhance the ability to carry out low-latency remote warfare. With this capability, China—or military actors that it supports—could connect to remote controlled drones and missiles beyond its line of sight via a satellite connection with almost zero latency. Indeed, the Chinese are already known to be training in remote warfare tactics, and these new satellites only further augment such low-latency capabilities.<sup>25</sup> The threat may extend beyond dedicated military drones in China’s periphery. From a homeland defense and homeland security perspective, the recent U.S. response to the New Jersey drone sightings did not inspire confidence in its ability to counter unauthorized

drone activity, much less for some future dedicated mal actor.<sup>26</sup> It is worth noting that China’s DGI is already the largest provider of commercial drones in the United States. Moreover, depending on the model, a DGI drone can already receive satellite signals from GPS, GLONASS, GALILEO and BeiDou,<sup>27</sup> and drone operators are already experimenting with using beyond-line-of-sight connections such as via satellite broadband.<sup>28</sup> Future satellite broad-band capable commercial drones will provide a weaponizable ‘fifth column’ that might be mobilized at any moment, and controlled from any point on Earth.

## Electronic Intelligence and Targeting

Satellites have become an increasingly indispensable tool in warfare because of their ability to provide real-time data on a variety of salient topics, from the number of people in a given area to the height of buildings there. These capabilities have obvious applications for intelligence collection and espionage, and the Qianfan network greatly expands China’s capacity to carry out surveillance. This represents an area of enduring interest for Beijing, and the PRC has already attempted to use Starlink satellite signals to “detect a stealth object in the South China Sea,” a line of effort that could expand to potentially better track the F-22, F-35, B-2 and B-21, the most advanced stealth aircraft in America’s arsenal.<sup>29</sup> This power could significantly erode the credibility of the U.S. to employ any sort of stealth aircraft, and accordingly give China greater control over contested areas (such as the South China Sea).



**“As China rapidly expands this network of satellites, it grows in informational power. As a result, it could acquire a dominant position in global connectivity, greatly expanding the reach and impact of its messaging, propaganda and influence operations.”**

## Amplifying Cyber Espionage and Attack Opportunities

Included in the sabotage risks of an expanding Chinese satellite network is the possibility of it being used as a vector from which to launch computer network attacks. According to the U.S. Space Systems Command, “attacks [in the space domain] can include hacking on-orbit satellites; infiltrating the ground-system computers that control and receive data from the satellites; compromising drones; or affecting other computer systems, which in turn can compromise everything from satellites to power grids and other infrastructure.”<sup>30</sup>

Attacks against ground and satellite infrastructure have already been demonstrated. For example, in February 2024, Ukraine’s satellite networks were hacked and shut down in tandem with Russia’s invasion. Telecommunications firm Viasat said hackers disabled the modems that connected internet users to their satellites, which in turn had serious political effects.<sup>31</sup> Russia has also attempted to jam and interfere with Starlink.

However, the existence of a broadband mega-constellation provides a new vector for such cyber-attacks. Such satellite networks host “cognitive radios,” with the ability to digitally create a broad array of signals that might target receivers on the ground or within competitor satellites. This function enables the full potential of existing electromagnetic and cyber attacks, from jamming uplink/downlinks to in-orbit radio and data-link receivers, to DDoS attacks and the distribution of malware. Rival satellites may be vulnerable to hacking

via satellite to place malware so as to gain access to their functions or even shut them down completely. Since each satellite is essentially a broadband wireless server, it has the potential to operate as a “bot net.” In this scenario, there is the risk of a satellite network-initiated DDoS (distributed denial of service) attack—which could overwhelm servers with traffic to inhibit data transmission, could lead to a failure to gain critical data, or even cause a brief forfeiture of the satellite altogether.<sup>32</sup> In the hands of a Chinese state actor, the consequences of this capability are potentially manifold.

## Harmful Interference

To understand the strategic significance of China’s satellite advances, it’s necessary to grasp how China views American forays into this domain. China’s military has responded to Starlink’s rise by accusing the U.S. of seeking to militarize space to achieve space dominance. On May 25th, researchers affiliated with the PLA’s Strategic Support Force (SSF) published a defense white paper urging the development of a “combination of soft and hard kill methods [...] to make some Starlink satellites lose their functions and destroy the constellation’s operating system.”<sup>33</sup> China views Starlink not only as a major commercial competitor but as a potential force multiplier for the United States in future conflicts. Therefore, developing counter-satellite capabilities have taken on a renewed sense of urgency for Beijing.<sup>34</sup>

In truth, China has possessed some of these capabilities for a long time. Others, however, are cutting-edge, and include cyberwarfare, electronic warfare (EW), and even

**FIGURE 4: China Global Counter Space Capability Assessment<sup>35</sup>**

	R&D	TESTING	OPERATIONAL	USE IN CONFLICT
LEO Direct Ascent	▲	▲	▲	●
MEO/GEO Direct Ascent	■	■	—	●
LEO Co-Orbital	■	?	—	●
MEO/GEO Co-Orbital	■	—	—	●
Directed Energy	▲	■	—	●
Electronic Warfare	▲	▲	▲	■
Space Situational Awareness	▲	▲	▲	?

LEGEND: NONE ● SOME ■ SIGNIFICANT ▲ UNCERTAIN ? NO DATA —

Source: Secure World Foundation

directed energy weapons (DEWs).<sup>36</sup> Yet the PRC has not precluded the use of more extreme measures to subvert rival satellite constellations. To the contrary, it has made critical investments in a variety of anti-satellite capabilities.

For example, in 2007 China successfully tested an anti-satellite missile that destroyed one of its own aging weather satellites. Since then, it has continued developing ways to subvert rival systems, including exploring nuclear weapons in space. According to one 2022 report, “PRC researchers identified ways of modulating the shape and size of a nuclear radiological cloud in [low-Earth orbit] by adjusting detonation altitude and yield.”<sup>37</sup>

China is also keen on exploring non-kinetic weapons. Chinese scientists have considered the use of cyber warfare, directed energy weapons, and electronic warfare countermeasures to take out rival systems like Starlink. According to one report from a United States Air Force think tank, “China is preparing to conduct disruptive cyberattacks against satellites by targeting onboard processors and memory units and exploiting vulnerabilities in VxWorks, a common operating system used by satellite operators.”<sup>38</sup> This suggests that China has been actively developing cyber weapons aimed at disrupting U.S. satellites by targeting software that is commonly used by the American military.

In addition to cyberattacks, China could also deploy electronic warfare against rival systems. While the full extent of China’s electronic warfare capabilities in space is not publicly known, it is highly likely that the PRC has concluded that a conflict with the U.S. will spread to the space domain, and is developing critical capabilities in this regard.

China already possesses an arsenal of anti-satellite capabilities that can disrupt, disable, or destroy Starlink—and is now actively developing new ones. These capabilities provide China’s military leaders a variety of options to deny U.S. access to LEO. However, of specific concern is that China’s new internet constellations themselves may be seen as a means of “suppressing Starlink.” It has often been noted that the most effective way to jam a satellite is with another satellite. But the PRC may be pursuing even more deliberate harmful interference. As one recent report has noted:

Chinese researchers from the People’s Liberation Army’s Space Engineering University in Beijing say they’re planning to build a powerful constellation

network consisting of exactly 12,992 satellites to compete with Elon Musk’s SpaceX program... But—this is where it gets interesting—China’s satellites will be designed to detect, identify, track and catalog the details belonging to each and every satellite in the Starlink fleet. What’s more, the satellites will be equipped with new AI weapons, including lasers and high-powered microwaves, developed for use to destroy Starlink satellites that pass over China and other sensitive regions.<sup>39</sup>

## Future Implications

The implications of China’s Qianfan network are profound, and posit grave risks to national and international security. First, as China is progressively able to offer greater connectivity to countries with a high demand for modernization, it will be able to position itself as an information provider of first resort—and to package official messaging and propaganda alongside its internet offerings. Second, given the contentious relationship between China and Taiwan and the real possibility of a Chinese invasion of the island, Qianfan also has clear military applications, and could be used to augment and amplify command, control and coordination in the event of such an attack. Lastly, Qianfan has the potential to spark an arms race in anti-satellite technology between the U.S. and China, as Washington and Beijing increasingly expand their competition into LEO space.

Qianfan, in other words, is proving itself a force to be reckoned with. It is also one the U.S. will need to seriously contest. In an ideal world, international space governance is an optimal solution to such competition in LEO. Currently, however, it is unrealistic to think that the U.S. and China can come to such an arrangement. As a result, policymakers in Washington need to focus on steps such as increased cooperation with allied space initiatives and expanded digital offerings to, and infrastructure development in, the Global South if they hope to seriously contest China’s growing foray into digital dominance.

## Endnotes

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[constellation/](#).

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# Space Policy Review

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For America, space represents the next great strategic frontier. Yet the United States now faces growing competition in that domain from countries like Russia and China, each of which are developing technologies capable of targeting U.S. space assets. As such, defining a strategy for ensuring space security, sustainability, and commerce needs to be a strategic priority for the U.S. AFPC's top-notch array of experts form a robust team that make a major contribution to crafting space policy by providing policymakers with the ideas and tools they need to chart a course in this emerging domain. For regular insights from space thought leaders tune into SPI's Space Strategy podcast (available at <https://anchor.fm/afpcspacepod>). SPI co-directors: Richard M. Harrison and Peter A. Garretson

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