

Military- Civil Fusion: China's Space Capabilities

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Abstract

China's military strength has grown rapidly, and the most attention-grabbing military forces such as the Navy, Air Force, and Rocket Army are also affected by regional security and power structures. However, the command, control, communication, intelligence, surveillance and other capabilities necessary for battlefield management are the key to success in determining the ability of military projection. Therefore, China's vigorous development of space capabilities, including projection vehicles and satellites, has made great progress, especially its satellite positioning capabilities and battlefield sensing have also achieved more advanced standards, which will greatly increase the PLA's actual operation strength.

At the same time, from a geopolitical point of view, China's substantial increase in space capabilities has also led to greater support for the Belt-Road Initiative (BRI) strategy. Including regional earth resource surveys, ocean monitoring, and enhanced communications capabilities will enable Central Asia, Southeast Asia, Eastern Europe, Africa, which

developing countries could be support by Beijing to enjoy advanced space technology to support economic development, thus Beijing has a greater substantive influence.

In geopolitical strategy, China can also more effectively acknowledge the battlefield conditions and situations through enhanced space capabilities, especially the maritime threats from the Pacific Ocean or the Indian Ocean, and to manage the threats or crises that emerge through the projection forces of the bluewater navy and the long range air force which quick and rapid response in close proximity. At the same time, the PLA military influence extends from the first island chain to the second island chain. Not only will it stop the threat at sea, but it will also seriously challenge the influence of the US Navy.

In particular, the Dongfeng 17 hypersonic gliding vehicle(HGV) and the Dongfeng 100 long-range supersonic supersonic missile displayed by China on National Day are all battle and theater-class weapons developed with space technology. They have a option of flexibility and can attack a single target or strike military critical infrastructure and have a high chance to break through the missile defense system, which is an serious challenge for regional security and geostrategy.

Keywords : China's Space Strategy 、 Beijing's Space Capabilities 、 Military- Civil Fusion and Space Warfare

I. Introduction¹

China successfully launched a pair of BeiDou Navigation Satellite System (北斗導航衛星,BDS) satellites by a Long March-3B (長征3乙型火箭) launch vehicle (with an Expedition-1 upper stage) from the Xichang (新疆) Satellite Launch Center, on Sep 23th, 2019. The pair are the 47th and 48th BDS satellites,² and another 5 new earth observation satellites into orbit, these satellites will join a commercial satellite constellation built and operated by the Chinese company,³ Which is really to help Beijing to get a right to engage global politic power by space abilities. Such technologies further encourage and strengthen the moral of Chinese politic elites and citizen to struggle with foreign power. At the same time, in early 2019, China's science fiction film

¹ Part of this article is rewritten from Su, Tzu-yun, "Chinese Aerospace Industries and Military Potential Capabilities," *Defense Situation Monthly*(Taipei: INDSR, 2019), No. 144, pp. 19-31.

² "China Successfully Launched the 47th and 48th BDS Satellites, which brings good news to celebrate the 70th Birthday of PRC," BeiDou Navigation Satellite System, Sep. 23, 2019.http://en.beidou.gov.cn/WHATSNEWS/201909/t20190927_19077.html

³ Hanneke Weitering, "China Launches 5 New Earth Observation Satellites into Orbit," Space Com, Sep. 19, 2019.
<https://www.space.com/china-third-zhuhai-satellite-launch-success.html>

"Wandering Earth" (流浪地球) described China's space adventure story of leading the world to escape from the solar system, breaking through the box office records of Chinese local films, highlighting the will and enthusiasm of the Chinese government and the people for space development. In fact, the overall combat power of the C4ISR formed by space satellites is the backbone of the future war.

In 2018, China successfully landed on the back of the moon and launched satellites from a sea platform for the first time on June 5, 2019. This means that Xi Jinping's "Space Dream" has succeeded in fastening the wishes of the Chinese people and actively developing commercial, official, scientific and other civilians. The so-called "non-military" satellites actually hope to expand the application and economic benefits of space technology through multi-purpose development, and reduce the cost of military technology by means of "fusion of military and civilian." (軍民融合) However, the rapid development of its space military power also poses a security threat to various countries. Japan's *2019 defense white paper* points out that China has the capabilities to master space.⁴ At

⁴ Fulin, "Japan released 2019 Defense White Paper: The PLA is major threat," *rfi*, Sep. 27,

2019.<http://www.rfi.fr/cn/%E4%B8%AD%E5%9B%BD/20190927-%E6%97%A5%E6%9C%AC%E5%8F.%91%E5%B8%832019%E9%98%B2%E5%8D%AB%E7%99%BD%E7%9A%AE%E4%B9%A6%E4%B8%>

the same time, Kiribati cut off official diplomatic relations with Taiwan on September 20 and chose to establish diplomatic relations with China. Since Kiribati originally had a Chinese earth tracking station,⁵ Not only diplomatic events, but also geopolitical considerations, it is a part of the strategy for Beijing. Because Kiribati is located in the third island chain and the southern hemisphere, it is one of crucial elements for the China's global space strategy.

In 2018, China carried out a total of 37 space launch operations. "The number of space launches mission in the world was the first in 2018 , and the number of satellites deployed was the second in the world."⁶ This also indicates that China's development of military mission applications will seek further development, including key innovative applications such as permanent manned/ crewed space stations, weapon deployment, and the use of quantum technology for communications. All these capabilities actually effects the cyber

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⁵ "China developing space earth station in Kiribati," *Liberty Times*, Sep. 22, 2019. <https://news.ltn.com.tw/news/politics/breakingnews/2923145> .

⁶ Ma, Shu-an, "Chinese Aerospace: the number of space launch mission was the first in 2018," *Ettoday NewsCloud*, Jan. 30, 2019. <https://www.ettoday.net/news/20190130/1369124.htm> .

security, battlefield management, and missile defense in the shrot coming future. Not only the regional security, but also the situation of geostrategy will face a shock and new challenges.

II. China's Space Policies and Strategies

China's aerospace industry can generally be divided into military and non-military sectors. The family of non-military satellites can be mainly divided into returning remote sensing satellite series, "Dongfanghong"(東方紅) communication broadcasting series, "FengYun"(風雲,FY) meteorological satellite series, " Practice"(實踐) scientific exploration and technology test satellite series, Earth resources series. Although these are civilian, they have the ability to scan on the surface and even some of the underlying shallow coverings due to their visible and invisible light observation abilities, and synthetic aperture radar(SAR) scanning, etc., which poses a threat to competing military deployment. In contrast, commercial and scientific satellites in countries including China have similar capabilities and ready to support military use. This is the potential of “dual-use”. Therefore, while developing the civil aviation industry, it can also improve the overall space. Military capabilities and reduce costs. At present, China's space strategy can be described as follows:

1. The Space Policies

The *2016 China Aerospace white paper*(2016中國的航天

白皮書) was issued by the "National Space Agency". The focus of its announcement is different, including: (1) The goal is to provide strong support for the Chinese dream of the great rejuvenation of the Chinese nation and for the progress of human civilization. Make positive contributions; (2) Innovative development. Put independent innovation in the core position of the overall development of the aerospace industry, stimulate innovation and create vitality, and promote the development of the aerospace industry; (3) Coordinated development. Encourage and guide social forces to participate in aerospace development in an orderly manner, scientifically coordinate the deployment of various space activities, promote the all-round development of space science, space technology and space applications, and enhance the overall development quality and efficiency of aerospace; (4) Peaceful development. Always adhere to the peaceful use of outer space, oppose the weaponization of outer space and an arms race in outer space, rationally develop and utilize space resources, effectively protect the space environment, maintain a peaceful and clean outer space, and enable space activities to benefit all mankind; (5) Open space. Adhere to the combination of independence and open cooperation, and actively carry out space international exchanges and cooperation on the basis of equality, mutual benefit, peaceful use and inclusive development, and commit to promoting the common progress and long-term sustainable development of the human space

industry.⁷

2. The Space Strategies

China's space strategy includes official documents, as well as statements from political elites, which are used as the main basis to be further defined by actual activities. The representative expression of Chinese political elites on the aerospace industry, including former Prime Minister Zhou Enlai began to promote space development in 1965, is called the "718 Project." (七一八工程) Later, in November 2009, Xu Qiliang (許其亮), vice chairman of the Chinese Military Commission, publicly pointed out that space is "the new high land of international strategic competition ... who can control the land, ocean and electromagnetic spectrum space, who can manage the strategic initiative." As well as the "space dream" put forward by Xi Jinping, "the dream of space flight is a core part of the dream of a strong country; the dream of space is also an important part of realizing the great dream of the Chinese people to rejuvenate the nation."⁸

⁷ National Space Agency, *2016 China Aerospace* (Beijing: State Council Information Office, December 2016),
<https://www.scio.gov.cn/37236/38180/Document/1626692/1626692.htm>

⁸ Huang, Che-wen translated, "China Space Strategy and Development: The US Should Response Fast,"
YouthDaily(Taipei), Oct. 12, 2016.
<http://www.ydn.com.tw/News/144407>.

The latest official documents are mainly represented by the *2019 Defense White Paper: The National Defense in New Age*, *2015 China Military Strategy* and the *2016 China Aerospace White Paper*. The 2019 defense white paper make a statement that public idcates “space, space properties is one of China's national interests.”⁹ The "China's Military Strategy", which belongs to the military, understands that space is "the key high-ground of international strategic competition", and the main strategies are: (1) advocate peaceful use of space, oppose space weaponization and space arms race; (2) Actively participate in international space cooperation; (3) closely track the space situation and respond to space security threats and challenges; (4) safeguard space asset security, serve national economic construction and social development, and maintain space security.¹⁰

Although the China declared in its official documents that

⁹ “2019 Defense White Paper: National Defense in a New Age, “ *Xinhua News Net*, July 24, 2019.

http://www.xinhuanet.com/politics/2019-07/24/c_1124792450.htm .

¹⁰ Ministry of National Defense, *China's Military Strategy*(Beijing: MOD, May 2015),
http://www.mod.gov.cn/big5/regulatory/2015-05/26/content_4617812_5.htm.

it "opposes space weaponization and space arms race"¹¹ However, China's perspectives on the development of aerospace (space) military forces, and the exhaustion of the actual situation in the past decade have been completed in addition to the "Beidou" series of navigation satellites that have been widely watched and monitored by the western countries, such as marine surveillance, synthetic aperture monitoring satellites, and communication satellites. All these functional satellite system clearly shows that China's strategic goal is to block the enemy's space use to gain complete battlefield advantage in wartime. In anti-satellite technology, Chinese anti-satellite missiles are about 20 years behind the US military, but laser technology is easier approach to break through. The opportunity to level the gap with the US military. It can be estimated that by 2020, China has the space control capability, both software and hardware, and has complete armed space capabilities. When necessary, it can quickly convert a human space station into a space attack base and even throw firepower to the earth to attack key facilities.

III. China's space capability

1. Launch Vehicle Technologies

¹¹ Xinhua, "Introduction of China's Military Strategy," Xinhua News Net, May 26, 2015.

http://www.mod.gov.cn/affair/2015-05/26/content_4588132_2.htm .

According to the "2016 China Aerospace white paper," the China's space projection and operational capabilities can be integrated as follows:

(1) Rocket launch vehicles can divide into three classes according to the payload capacity. The main series of the latest launch vehicle, including "Long March 5"(长征五型, CZ-5), is a large-scale launch vehicle. After 10 years of research and development, it successfully made its first flight on November 3, 2016. Its diameter is increased from 3.35 meters to 5 meters, while the carrying capacity is 25 metric tons for low earth orbit (low orbit) and 14 metric tons for synchronous orbit (high orbit).¹²

The "Long March 7"(长征七型, CZ-7) low-travel carrying capacity is 13.5 tons and is designed as a medium-sized launch vehicle.¹³ "Long March 6"(长征六型, CZ-6) adopts the same series of engines, designed as a small launch vehicles for fast response mission, capable of projecting 1,000 kilograms of payload to sun-synchronous orbit ,¹⁴ The

¹² National Space Agency, 2016 *China Aerospace*, op., cit.

¹³ Wang, Nan-nan, 'CZ 7 first success launch.' *Xinhua*, June 25, 2016. http://www.xinhuanet.com//mil/2016-06/25/c_129089901.htm

¹⁴ "CZ 6 first success launch, and created record of depoly multiple satellites with a single rocket," *Xinhua News*, Sep. 20, 2015. https://web.archive.org/web/20150930164546/http://news.xinhuanet.com/photo/2015-09/20/c_128247844.htm.

three types of launch vehicles are expected to meet the main needs of the 2020s.

In the manned/ crewed space mission, on March 15, 2003, the Chinese space projection 921 used the Shenzhou-5 (神五) spacecraft to successfully send the astronaut Yang Liwei (楊立偉) in Earth orbit for more than 20 hours, making it the third country to carry out manned space missions. The Shenzhou project has sent nine astronauts into space.

2. Satellite Technologies

(1) Telemetry satellites: China's satellites are divided into satellite series such as "FengYun" (風云), "Ocean" (海洋), "Resources" (資源), "High Score" (高分, Gaofen), "Remote Sensing" (遙感), Mapping Satellite (天繪), and "Environment and Disaster Monitoring and Forecasting for Disaster Prevention satellite constellation." The "FengYun" meteorological satellites have formed a constellation system, which is composed of polar orbiting satellites, the FY-3 series are polar-orbiting sun-synchronous orbits, and FY-2, FY-4 series are in geosynchronous orbit. The "Ocean 2" marine monitoring satellite provides comprehensive observations of all-weather and high-precision ocean dynamic parameters such as sea level, ocean waves and surface wind fields. Earth Resources Satellite, mainly consisting of "Resource One," "Resource 02C," and "Resource 3," together with mapping satellites form a binary network.

Use multi-spectral sensors to observe the distribution of

various resources. The surface observation satellites are mainly the "Gaofen- 2" satellites with an optical resolution at the metric level, the " Gaofen- 3" with a synthetic aperture radar resolution of metric, and the "Gaofe-4" of the first synchronous orbit observation satellite. Disaster prevention satellites rely on environmental and disaster monitoring and forecasting of small satellite constellations to be put into operation. It is particularly important to note that the "Jilin 1" high-resolution commercial remote sensing satellite is capable of optical dynamic filming,¹⁵ is high military potential °

(2)Communication broadcast satellite. It mainly includes the construction of three major systems: fixed communication, mobile communication and data relay satellite. The two major families of "Asia Pacific" (亞太) and "Zhongxing" (中星) are fixed satellites to cover China's territories and key regions of the world. "Tiantong- 1" (天通1號) is the first mobile communication satellite for mobile and backup communications. The "Tianlian- 1" (天鏈 1號) satellite consists of three first-generation data relay satellite systems for the high-speed communication test of the grounded- space laser datalink and has been successful. The "Dongfanghong 5" (東風紅 5號) is ultra-large communication satellite continues to

¹⁵ China's Jilin series 1 Gaofen- 3 satellite send the first image, taken in Los Angeles," *HK News*, June 6, 2019.

<http://www.hkcn.hk/content/2019/0606/767211.shtml>

develop.

(3)Navigation satellite. The Beidou (北斗) second generation system is fully deployed. Currently, Beidou navigation satellites are networked to cover users in the Asia-Pacific region, providing positioning, speed measurement, correct time, wide-area differential, and short message communication services. The successor of the "Beidou III" navigation satellite will aim to achieve global coverage by 2020.¹⁶

(4)New technology test satellite. It is mainly used for the "Practical" series of satellites for space technology such as communications, life sciences, satellite formation, and electronic equipment.

In addition, China completed the connection task of the manned spacecraft and the orbital laboratory for the first time in early 2012. At the same time, the future mission goal is to build a 60-ton space station by 2020.¹⁷ In 2013, the "Yutu" (玉兔, Jade rabbit) lunar rover completed the first soft landing of the moon since 1976, and landed on the back of the moon at the end of 2018. It also plans to launch a Mars rover by 2020.

¹⁶ Kuo-li Lee, Lian-jun Ju, "China success to launched and depolyed 2 Beidou satellites, it is the beginning of mass Beidou depoyment operation in 2019," Xinhua News Net, Jan. 12, 2018.http://www.xinhuanet.com/2018-01/12/c_1122249958.htm .

¹⁷ Huang, Che-wen translated, op., cit.

This marks the key technology that has the most important reliability and precision in space technology.

IV. Domestic Market and Resources

The output value of the space market means that the development cost of space technology can be reduced. According to the assessment of international institutions, the global space market production value in 2016 is 345 billion US dollars,¹⁸ It will be \$360 billion in 2018 and will grow to \$555.8 billion by 2026.¹⁹ In China, the commercial aerospace market is estimated to reach 800 billion yuan (\$135 billion) by 2020, mainly including commercial launches, satellite in-orbit delivery, ground control stations, satellite applications, insurance, personnel training, and technology. Transfer, etc.²⁰

According to the China National Aerospace Administration, its development goals in the next five years (by

¹⁸ Bryce Space and Technology, LLC, *Global Space Industry Dynamics: Research Paper for Australian Government, Department of Industry* (Alexandria, VA: Bryce Space and Technology, LLC, 2017), pp. 1-2.

¹⁹ ReportBuyer, "Global Space Industry Market and Technology Forecast to 2026," Jul 10, 2018.

<https://www.reportbuyer.com/product/5471992/global-space-industry-market-and-technology-forecast-to-2026.html>

²⁰ Cao, Xu, "China boots up space commercial market which is predicated to reach 800 billion RMB a year, " China Economic Weekly, Dec. 25, 2017. <http://www.ceweekly.cn/2017/1225/214119.shtml>

2020) will increase the transformation and upgrading of the aerospace industry's capabilities, and accelerate the development of the satellite application industry. "Strengthen the development of satellite convergence application technology and promote satellites. The application will be integrated with emerging industries such as the Internet, big data, and the Internet of Things to create new products, new technologies, and new formats, foster new economic growth points, and help "public entrepreneurship and innovation."²¹

The details of the practical use of the Chinese space market are not completely transparent. At this stage, media audio and video transmission, GPS navigation, and voice data communication are mainly large, and other services such as geodetic monitoring and meteorological services are included.

According to the "Union of Concerned Scientists", there are currently 2,062 satellites in the world, mainly including more than 1,353 in the United States, China and Russia.²² In other words, the three major space powers to account for 65% of the total number of satellites, China has 299 satellites, and will adopt a positive development policy to shorten the gap

²¹ National Space Agency, 2016 China Aerospace White Paper, op., cit.

²² UCS, "UCS Satellite Database," Union of Concerned Scientists, March 3, 2019.

<https://www.ucsusa.org/nuclear-weapons/space-weapons/satellite-database>

with the top US. The development model of "fusion of military and civilian" can be used as a comparison by other fields. For example, China's shipbuilding industry ranks first in the world. According to estimates by think tanks such as Jane's group and Institute of International Strategic Studies (IISS), Compared with the growth of China's naval main warships in 2010 by about 2.5 times (130 ships), ocean-going projections have greatly improved. In addition, its rapidly developing cyber warfare capabilities, combined with the information penetration capabilities of industrial products, and the proximity of nearly 299 satellites make it the second largest space-capable country in the world. Together with the level of global power of its overall military capabilities.

In the 17 years from the 2000 year of WTO accession to 2017, the overall economy grew from 2.4 trillion US dollars in 2001 to 10.2 trillion US dollars, and military spending increased from 20 billion US dollars to 150 billion US dollars.²³ In contrast, economic growth of 325% and military spending growth of 650% can be greatly used for equipment development. The key shift in the future is in the trade war between the United States and China. Since the CCP's annual trade surplus of 80% is 375 billion US dollars from the US

²³ Department of Defense, "Annual Report to Congress on Military and Security Developments Involving the People's Republic of China 2017," May 2017, p 66.

market, if Beijing can successfully survive the trade war and transform successfully, its economic strength will be able to stabilize its defense affairs. investment.

Satellite By Major Powers (March 2019)			
Country	U. S,	China	Russia
Num.	901	299	153
Source : Union of Concerned Scientists			

V. Conclusion: Potential Military- Civil Satellites

As mentioned above, China currently has 299 satellites in orbit. Compared with the US 901, there is still a large gap, but it is already the second largest space power. Its main capabilities are communication, positioning, battlefield mapping and supervision. The investigation will make the battlefield that it enters transparent and digital, and exert the maximum benefit of the firepower.

The military's main functions are surveillance, communications, and the space capabilities of the three major space systems. The actual development goals include:

(1) Large manned spacecraft: a multi-person manned space flight, accumulating operational energy and training astronauts (astronauts) to establish a space medicine database, with the ultimate goal of establishing a long-term manned space station for profit Subsequent scientific experiments and space

technology are further developed.

(2)Physical attack capability: In addition to the soft killing methods such as electronics, laser interference communication and optical sensors, China officially announced that it has actual hard space in space after it first used the intercontinental missile to revamp its anti-satellite missiles in January 2007. Kill combat capabilities. Since then, China has continuously strengthened its ability to build satellites, including the high-energy lasers of the "Shenguang" series, and the latest "Dongfeng 26" mobile missiles.²⁴

(3)Cross-generation communication: In addition to the existing communication satellites, China launched the "Mozi" communication satellite on August 16, 2016. It is the first satellite in the world to use quantum quantization technology.²⁵ The successful verification of quantum technology for communication encryption not only enables inter-continental communication, but also the voice and digital content transmitted by it can be ensured without being cracked. Such characteristics will be greatly benefited in military and economic applications.

²⁴ China News Net , June 29, 2014.

<http://big5.chinanews.com:89/mil/2014/06-19/6298529.shtml>

²⁵ "China success to launch first quantum satellite for science experiment, " China News Net, Aug. 16, 2016.
<http://www.chinanews.com/gn/2016/08-16/7973424.shtml>

(4)Strategic Psychological Warfare: The Chinese Communist Party has made significant progress in various types of indicators, including ships, space vehicles, and lunar landings, and is regarded as an important tool for "national prestige." At the same time, confidence in the subconscious of competing country will actually have an impact.

(5)Fusion of Military-civilian: Combining the aforementioned RMB 800 billion civil space market to expand the economic base, and to provide technical support for the development of military space and reduce the overall benefits of cost investment.

Of particular note is the psychological warfare protential value. In the history of space development, the United States also had a similar situation. In 1957, the former Soviet satellite launch successfully shocked the United States, promoting the US Apollo project for manned space flight and landing on the moon. Re-enhance the morale of the American people, gain space superiority and eventually surpass.

In short, the threat of the military potential of the aforementioned "civil satellites" to the battlefield can be mainly divided into:

(a) precision mapping of the battlefield, in addition to military installations, including the precise marking of the construction roads of the residential areas.

(b) Instant calibration of military deployment. In addition to the movement of ground and surface units, the thermal

image of the airport runway can also be used to measure the dynamics of the combat fleet. The relevant camouflage can be mapped with synthetic aperture radar.

(c) Weather conditions: including the dynamics of rainfall, wind speed, temperature and humidity, tides, walruses, etc. in the details of the battlefield, in order to facilitate the planning and response of military operations. (d) Public opinion psychological warfare: All kinds of broadcasting and communication satellites can transmit political warfare propaganda content and affect heart defense.

The future type of cyber warfare will be from the virtual space of satellite and network to the fields of finance, transportation, production, power control, etc. The most extreme phenomenon will lead to the actual destruction of the their opponents are at the disadvantage of battlefield transparency and digital command, they will face the risk of multiple points, while the common forces can play a concentrated advantage, making the battlefield confrontation an extreme strategic imbalance.

