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# CHINA'S EVOLVING SPACE PROGRAM : TOWARDS ACCELERATED MILITARISATION

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**Abstract**

Today China has a very advanced space programs covering a wide spectrum of activities.It is using its space assets to enhance its military strength and has acquired significant space capabilities, particularly in the field of satellite communication , intelligence, surveillance and reconnaissance (ISR), satellite navigation and meteorology. It has also developed interplanetary space exploration capabilities. Besides its on-orbit assets, as part of its space program China has created a strong infrastructure to build spacecraft and space launch vehicle . For China space signifies a military and economicventure that is growing steadily. Space systems form a integral part of its information infrastructure.China is focussing on building its Space assets as it enables improved surveillance over a wide area and enhanced long-range precision strike capability .It improves the ability to mobilize military assets and coordinate its military activities to strike more accurately and effectively . It also facilitates a better battlefield damage assessment . China is acquiring counter-space capabilitiesand increasing investments in space systems and technologies to further its national security objectives. China is steadily increasing its capability to threaten adversary satellites both in the low earth orbit and the geostationary earth orbit. It is is rapidly developing advanced anti -satellite capabilities.

**Key Words : China Space Militarisation Anti Satellite ASAT national security**

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## Introduction

Dr Qian Xuesen is regarded as the father of China's missile and space program. In 1935 he went to the Massachusetts Institute of Technology (MIT) in the U.S on scholarship. He later become the first director of the Jet Propulsion Centre at Caltech in 1949. During World War-II, he worked on jet propulsion and along with a number of other US scientists, he devised a range of highly effective missiles . During the anti - communist movement in the US ,he was accused of being a communist sympathizer in 1949 and was detained. In 1955, he was permitted to return to China. On his return to China he worked with the Chinese Academy of Science. His skills and knowledge were very valuable in creating China's missile program and developing the Dongfeng (DF) missiles. (Kerry Brown, 2009). Qian's contribution to China's space and missile program has been very crucial and much of that expertise was based on his knowledge and experience gained when he was in the U.S. While China's nuclear weapon research was still in theoretical study stage, China began to consider the nuclear delivery system and Dr Qian Xuesen was the leading figure in the development of rocket technology in China . (Chinaspace Report, 2018a)American forces in Operation Dessert Storm conclusively demonstrated the significant contribution and value of space assets in military operations. US satellites served as significant force multipliers for its conventional weapon systems. Space assets provided time critical data and information related to ballistic missile attacks, communications, real time weather information, highly accurate navigation and positioning, and crucial intelligence and reconnaissance information about enemy forces and assets. The Chinese have understood this very well . Chinese strategists have also learnt the concept of space dominance. The Chinese leadership now strongly profess space as an essential dimension of regional warfare. (David Thompson and William Morris, 2001) . Today China has risen to become one of the most ambitious and successful space faring nation . China's space programme covers a wide spectrum of activities . It is building its own space stationand has plans to capture asteroids . China has developed advanced space capabilities and has successfully landed a rover on the moon. China is planning to send a space craft to the Mars by 2020. which will consists of a obiter , lander and rover (Abigail Beall , 2017).China's over all economic growth in the past few decades is also reflected in the field of space as well. Along with the country's growing economic power and international influence, it has also taken a big leap in terms of its space program. This encompasses the development of the Long March rocket

family, the deployment of their first space station, and the Chinese Lunar Exploration Program Changé. (Williams, 2018)

**Space Launch Vehicle Program**

China today has a very robust space program in the world, supported by very reliable Space Launch Vehicles. China's space-launch infrastructure, includes space-launch centres and space-launch vehicles which provides China a wide flexibility in space mission planning. China today has space launch vehicles with lift capacities ranging from light to medium-heavy lift which are capable of deploying satellites into low earth orbit (LEO) to geosynchronous earth orbit (GEO) to support its national goals and objectives. (US DoD, 2015a)The firstthree launch facilities of China were located deep inland, hundreds of kilometres away from the sea. These included Xichang in the Sichuan province, Jiuquan in the Gobi desert in Mongolia, and Taiyuan in the Shanxi province. China began construction on its fourth launch site the Wenchang Space Launch Centre in 2009. Wenchang is located on the Hainan island , off the coast of the South China Sea. and was inaugurated for launch of satellites in 2014 (Marina Koren, 2018)

It was in the second half of 1965 that China began development of the CZ-1 (Changzheng Long March-1) launch vehicle The key objective of the project was launching of China's first satellite, the DFH-1. The CZ-1 design was in fact a modified DF-3 intermediate range ballistic missile. China's First satellite launch attempt in November 1969 ended in a failure. However the CZ-1 launch vehicle for the first time successfully placed the DFH-1 satellite into orbit on 24 April, 1970 . China became the fifth nation after the former Soviet Union, the United States, France and Japan to launch its own satellite using indigenous launch vehicle (Astronautix, 2018 ) .The long March -1 was soon replaced with the long March -2 family of launchers . which were developed, based on the Dong Feng 5 (DF-5) intercontinental ballistic missile (ICBM). The long March -2 has been the workhorse for satellite launch for over four decades . (Chinaspacereport, 2018b)

The Long March 5 which was successfully launched in November 2016 has been China's largest and most powerful launch vehicle, capable of lifting payload to a high orbit. (GBtimes, 2018a) . On June 25, 2016, the Long March 7 rocket, a more powerful launch vehicle blasted off from Wenchang, Hainan island to a successful maiden flight. (Jeffrey Lin and P.W. Singer , 2016). China intendeds to cut down the cost of development and production of Long March 8 by using a major module of Long March 7 (Aviation Week,

2017) . China has plans to launch its heavy-lift rocket Long March-9 intended for future manned lunar landing and deep space exploration missions around 2030. (China- ceec, 2017)China also plans to recover the first stage of the under development Long March-8 carrier rocket as a part of China's ongoing efforts to develop reusable space vehicles at the China Academy of Launch Vehicle Technology. (Chengcheng, 2018)

**China's Satellite Program**

The Fanhuishi Weixing-1 (FSW-1)or recoverable satellite was launched from Jiuquan Space Launch Center, and was the first successful Photographic Reconnaissance satellite , launched in November 1975 and was followed by two more tests between 1987 and 1992 (Astronautica, 2018a). In September 2000 China's launched Jianbing-3which was the first high-resolution military imaging satellite . The official Xinhua news agency stated that it was a civilian remote sensing satellite that would be used for territorial surveying. However it is believed to be reconnaissance satellite for military purposes, like targeting missiles at adversary forces. (Astronautica, 2018b) . **Yaogan - 1** Remote Sensing Satellite-1, which is China's first space-based synthetic aperture radar (SAR) system was launched by CZ-4C rocket from China's Taiyuan space center on 26 April 2006. It has been used as a military reconnaissance satellite known as Jian Bing-5 (JB-5). A series of follow on satellites with improved performance were launched subsequently(Skyrocket, 2018a). Space-based satellite information is required in support of target reconnaissance, missile early-warning, communications, precision guidance, battle field damage assessment and the construction of the digital battle field. Data obtained from a number of different satellites is integrated and with additional processing and data fusion, inputs for missile guidance is generated for long-range Anti Ship Ballistic Missile strike. (Ian Easton and Mark A. Stokes, 2011) **China Brazil Earth Resources Satellite (CBERS)**or **ZY 1 (ZiYuan)** satellites were designed for global coverage . It consists of cameras to make optical observations of the environment and collect data . The ZY series for the first time provided China with near-real time surveillance capability. China launched ZY-1 (CBERS-1) from Taiyuan Satellite Launch Center in October 1999 with sensors providing 20 m resolution digital images that could be directly transmitted to a ground station . Second generation ZY-2 satellites were launched in a lower orbit, offering finer resolution images with the same sensor array. The ZY-2 is considered a military reconnaissance system. (Skyrocket, 2018b)

Communications satellites development in China started at the beginning of the 1970s. In 1984 China successfully launched its first experimental geostationary orbit communications satellite . China successfully launched high-capacity GEO satellite , space-based data relays, tracking, telemetry and command assets , and other key technologies by 2011, which led to a significant improvement in the performance of China's satellites in voice, data, radio and television communications . (Global Security, 2018a). The Shijian-13 communication satellite successfully demonstrated the world's first experiment on high-orbit laser communication, a technology which enables a satellite to send, receive and transmit a large quantity of data to ground stations. It employs a Ka-band broadband communications system capable of transmitting 20 gigabytes of data per second, which exceeded the total capacity of all the previous communications satellites. Another technology which the Shijian-13 uses is an electric propulsion system, which permits it to carry more scientific instruments than previous satellites as it saves on weight compared to the traditional chemical propulsion system (Zhao Lei, 2018)

Meteorological Satellitesdeveloped by China enables it to conduct global multispectral observation. The Fengyun-2 and Fengyun-3 are meteorological satellite in the geostationary earth orbit (GEO) and polar orbit respectively . The Fengyun series is crucial part of the earth observation satellite system. In 2008 China announced plans to launch 22 meteorological satellites by 2020. (Global Security, 2018b)

**China's Advanced Space Programs**

A significant achievement of immense strategic importance that China has made is Quantum Communication. A Chinese satellite successfully transmitted so-called entangled photons to earth stations. This breakthrough has huge implications for cryptography. (David P. Goldman, 2017 ). China has succeeded in launching the world's first quantum satellite, which will enable it to build a "hack-proof" communications system , having significant military and commercial applications. (Tom Phillips , 2016 ) **.** China has independently built and operationalised the BeiDou Navigation Satellite System taking into consideration national security and economic and social development needs of the country. The BeiDou Navigation Satellite System is a space infrastructure of national importance that will provide all-time, all-weather , high-accuracy positioning, navigation and timing services . (The State Council Information Office of China, 2016) The Chinese government in

1992,took the decision to implement manned space program. China launched four Senzahu missions SZ-1, SZ-2, SZ-3 and SZ-4 between November 1999 to December 2002. These four missions laid a strong foundation of the manned space mission program . Shenzhou-5launched in 2003 was China's first manned spaceflight mission , followed by Shenzhou-6in 2005, which was the first multiple-crew and multiple-day spaceflight mission . The Shenzhou-7mission launched in 2008 was the first mission involving extravehicular activity. In this mission Space Walk was carried out for the first time by China (Ping, 2016).In the next phase of the programme, a permanently-manned space station is planned to be constructed in the Low Earth Orbit (LEO) by 2022.Tianhe -1 a 20tonne experimental core module of the space station will be launched around 2018-19 as a precursor mission. (China SpaceReport, 2018c)The design of Shenzhou is similar to the Russian Soyuz spacecraft. However the Shenzhou spacecraft is larger than Soyuz and is an all new construction designed by the China Academy of Launch Technology. (Aerospace-Technology, 2018)

.The first Chinese missions to the moon was the Chang'e 1 orbiter. The missions primary technical objectives was to develop and launch China's first lunar orbiter. It helped China to learn to design the basic engineering system for lunar exploration , validate the technologies essential for lunar missions,begin scientific exploration of the Moon, and gain experience for follow on missions. ( NASA Space Science Data Coordinated Archieve, 2018) . China's second lunar orbiter project **Chang'e 2** was originally built as the back up to Chang'e 1. It was fitted with improved instruments for launch in 2010. Chang'e 2 finished its lunar orbit mission in April 2011. (Skyrocket, 2018c)**. Launched in December 2013 Chang'e 3 was part of China's Lunar Exploration Program that had the stated goal of manned flights to the Moon. It was China's first lunar surface exploration mission using a lander and rover.** (Spaceflight101, 2018)**.** Chang'e-4 was a lander and rover combination, designed to land on the unexplored lunar far side of the moon. Its mission was geochemical surveys on the far side besides the study of formation and evolution of lunar crust . Specific lunar exploration activities before 2030 are planned for building a robotic lunar science station . (QiongWang and JizhongLiu, 2016) In 2020 China plans to launch its first Mars probe . It will be made up of three parts,orbiter, lander and rover. China aims to achieve three objectives , including orbiting, landing and roving exploration scheduled in 2020. (Charlotte Gao, 2017) . As the surface mission collects data, the orbiter will monitor the mars atmosphere and key scientific indicators . Mars may serve

as future robotic or human settlement. Studying its evolution can help answer some of the key questions in cosmology that can have a significant impact on our life. (Neil Connor, 2017). Tiangong-1 contains an experiment module , in which astronauts live and work ,and a resource module that houses the propellant tanks and rocket engines. The Tiangong-1 module was placed in low Earth orbit at about 350 kilometers, at a slightly lower altitude than the International Space Station and it can house three astronauts. A primary objective of the module was to enable China to practice space dockings, which is an important skill in order to build larger space stations or to send multiple spacecraft to the Moon, Mars or other celestial bodies in the solar system. (space.com, 2018). Chinese space station Tiangong-1**'s orbit around the planet gradually decayed and finally on 1 april 2018 it was caught up in the denser air that surrounds the earth.**(businessinsider, 2018)The launch of the first module for the Chinese Space Station is planned to take place in 2020. The Tianhe module will be the core of the three-module Chinese Space Station . China aims to keep the station fully crewed for at least a decade, with teams of three astronauts, each staying for 3-6 months a time, carrying out science experiments . (GBtimes, 2018b)

**China's Anti Satellite Program** China conducted its first successful direct ascent anti-satellite (ASAT) weapons test on January 11, 2007. It launched a ballistic missile fitted with a kinetic kill vehicle to destroy one of its own weather satellite Fengyun-1C in low earth orbit (LEO) in space. The ASAT was fired from a mobile transporter-erector launcher (TEL) (Shirley Kan, 2007). China launched a vehicle into space on a ballistic trajectory with a peak altitude above 30,000 km in May 2013. This means that it went up to near geosynchronous orbit, where communications satellites are maintained. Curiously enough no new satellite was released. The vehicle re-entered Earth orbit 9.5 hours after launch. Obviously the launch profile was not consistent with normal space-launch vehicles, ballistic missiles or sounding rocket launches used for scientific research. It indicates that it was a a test of technologies with a counter space capability in geosynchronous orbit. PLA writings highlight the need for "destroying, damaging, and interfering with the enemy's reconnaissance and communications satellites" , thus indicating that these systems including navigation and early warning satellites, could be among the targets of attacks intended to "blind and deafen the enemy". The act of damaging satellites and other sensors will greatly reduce the effectiveness of precision guided weapons. (US DoD, 2015b)

China's has adopted a asymmetric counter intervention strategy in which ASAT weapons are seen as key weapon system. The primary reason for this strategy is due to the overwhelming dependence of its adversaries on space based sensors to conduct military operations. Destroying or degrading these space sensors would mean weakening the enemy's war fighting capability to a large extent. It would result in reduced accuracy of adversary weapon systems . This would severely hamper adversary, particularly the US , precision and stand-off strike capability since most of its weapons and platforms depend on accurate and real-time information based on its space assets . (Arjun Subramanian, 2017)

Direct-ascent anti- satellite missiles are designed to disable or destroy a satellite using a a kinetic kill vehicle. The ASAT missile is launched against a pre-selected satellite , which must pass overhead within a certain distance from the launch site. China has also developed capability to jam satellite communications bands and global positioning satellites (GPS) receivers. China's ASAT programs have very significant implications for its anti-access and area- denial strategy against its adversaries .(Globalsecurity, 2018c). China has been steadily building up its space capabilities like more sophisticated space-based sensors, and ASAT capabilities which will strengthen China's conventional warfighting capabilities (Bill Gertz, 2016)

A crucial part of the anti-access and area denial strategy adopted by China is the ability to oppose adversary military forces from a distance, which is possible only with the support of space based sensors. Space allows China not only to detect and target distant forces but also to communicate with its own forces. China is evidently seeking to utilize space assets to achieve a real-time and accurate surveillance, reconnaissance, and warning system, and also enhance command and control in joint operations. China's anti-access and area denial strategy also called "Active Defense" by China, involves restricting enemy access to certain strategic locations,and this is dependent on space capabilities . (US DoD, 2015c)China may already possess the capability to damage optical sensors on satellites that are vulnerable to damage by lasers. Given China's current investments in laser technology, it is reasonable to assume that it is developing laser weapons that could destroy satellites in the future. (Cox, 1999)

The United States' top intelligence officials have emphasised the threat of space warfare in a hearing of the Senate Select Committee on Intelligence. In a written testimony in the 11May

2017 hearing, Dan Coats, director of national intelligence stated that China perceives it to be necessary to offset any U.S. military advantage it gets from its space assets. China is increasingly considering use of ASAT weapons against adversary satellite systems as part of their future warfare doctrine. Coats highlighted that China will continue to pursue a full spectrum of anti- satellite weapons as a means to reduce U.S. military effectiveness. (Leonard David, 2017).

The weaponization of space consists of placing weapons in outer space to attack or destroy targets in space .Militarization of space, consists of using space-based assets for Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance however the weapons are on the ground . The militarization of space supports armies on the conventional battlefield, whereas in weaponization of space, outer space itself emerges as the battleground (Vasani, 2017). China is investing massive resources into denying o adversary forces access to tools such as Position Navigation and Timing (GPS) data links, communication networks and radars. (Michael Hostage, 2014 )

Space capabilities are an essential part of sensor grids that provide critical information on what is happening in an area of operations. They provide the ability to operate forces over a wide area in a systematic way and provide information that makes application of force more precise and lethal.(Bob Work, 2016)

How disruptive an attack on satellite systems would depend on the type of satellite that is destroyed and the redundancy in the space system network. Satellite functioning could disrupted or degraded using non kinetic methods such as jamming of radio transmitters or blinding of satellite sensors using lasers. Satellite functions could also be denied or degraded through kinetic attack using an anti-satellite weapon ( National Academy of Sciences, 2016)

**Conclusion**

Earlier Military Satellites have been primarily used by China for passive support functions like communications, reconnaissance, early missile warning and weather data collection. However China is now using its space assets for more active role in force enhancement. China's military strategy highlights the need for using anti - satellite weapons to blind and deafen the enemy by disabling its sensors in space. The strategy highlights the need to destroy, damage and interfere with the adversaries reconnaissance and communications satellites. It is evident that navigation and early warning satellites, could also be among the targets of attacks of its anti- satellite weapons. China is steadily developing and refining its

ASAT capabilities as an important element of its multi-dimensional program to prevent the use of space-based assets by potential adversaries during conflict.

There is a clear technological relationship between ASAT weapons and Ballistic Missile Defence (BMD) weapon systems. A BMD weapon system designed for interception of incoming ballistic missile . It basically consists of the building blocks of a ASAT weapon system . A BMD system with some modifications , can be employed as an ASAT weapon against LEO satellites .

Also technologies projected as being developed for civilian space application such as inspection satellites and robotic arms for a space station and remote docking are in fact dual use technologies and could be used for development of co-orbital ASAT weapons. China is working on a wide range of high technology space weapons consisting of Anti - satellite missiles , lasers , GPS jammers and Killer satellites which could be used in any future conflict with its adversaries .

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