

# China advancing to become a global power in space exploration and mastering key strategic space technologies to enable key military space capabilities

President Xi Jinping wants China to become a global power in space exploration, with plans to send the first probe to the dark side of the moon by 2018 and to put astronauts on the moon by 2036. The Lunar Palace 365 experiment may allow them to stay there for extended periods.

“China possesses the most rapidly maturing space program in the world and is using its on-orbit and ground-based assets to support its national civil, economic, political, and military goals and objectives. China has invested in advanced space capabilities, with particular emphasis on satellite communication (SATCOM), intelligence, surveillance, and reconnaissance (ISR), satellite navigation (SATNAV), and meteorology, as well as manned, unmanned, and interplanetary space exploration, says Annual Report to Congress: “Military and Security Developments Involving the People’s Republic of China 2015”. In addition to its on-orbit assets, China’s space program has built a vast ground infrastructure supporting spacecraft and space launch vehicle (SLV) manufacture, launch, C2, and data downlink.

CHINA has launched its first unmanned cargo spacecraft on a mission to dock with the country’s space station, marking further progress in the ambitious Chinese space program. The Tianzhou 1 blasted off at 7.41pm Thursday (9.41pm Thursday

AEST) atop a latest-generation Long March 7 rocket from China's newest spacecraft launch site, Wenchang, on the island province of Hainan.

It is programmed to conduct scientific experiments after reaching the now-crewless Tiangong 2, China's second space station. A pair of Chinese astronauts spent 30 days on board the station last year. China launched the Tiangong 2 precursor facility in September and the station's 20-tonne core module will be launched next year. The completed 60-tonne station is set to come into full service in 2022 and operate for at least a decade. Communications with the earlier, disused Tiangong 1 experimental station were cut last year and it is expected to burn up on entering the atmosphere.

China was excluded from the 420-ton International Space Station mainly due to U.S. legislation barring such cooperation and concerns over the Chinese space program's strong military connections. Chinese officials are now looking to internationalize their own program by offering to help finance other countries' missions to Tiangong 2.

China is also engaged in militarization and weaponization of space. China has become a military space power within a global context and is developing a full range of space capabilities to match the US militarily in space, while continue to invest in asymmetric technologies that pose a greater risk to the US. China is believed to have a long-term plan to become a military space power within a global context and is developing a full range of space capabilities. Commander of the PLAAF, Xu Qilang, once stated that militarization of space was imperative for the PLAAF and it must develop a capability for offensive and defensive operations in outer space.

<https://www.youtube.com/watch?v=MZxVr1HDggo>

# Chinese team expects to launch first robot in space by 2020 to fix orbiting satellites

China's has become one of the top countries having the capability to refuel satellites in space. The nation's Tianyuan-1 system (launched aboard the Long March 7) has successfully topped up at least one satellite in orbit. Refuelling can extend the life of satellites, reduce their operational costs and also reduce the ever growing problem of junk.

China will launch its first robot in space by 2020 to carry out a range of tasks from refuelling satellites to building space stations and even conducting military operations, according to researchers involved in the project. When finished, it will be the most expensive robot China has ever built. Although the team responsible declined to provide figures, the first launch alone is expected to cost hundreds of millions of yuan (100 million yuan = US\$15.66 million).

The robot has two uniquely designed arms, each with seven articulated joints, to aid in its refuelling operations. One can extend and firmly grip objects while the other can inject fuel, they said.

However, the benefits of the Chinese project will far exceed the costs, according to the researchers. The robot will remain in space for years and will have a tank large enough to refuel numerous satellites or spacecraft, they said. It could also be turned into a multi-purpose robot with relative ease, they said.

The refuelling nozzle carried by its right arm could easily be replaced with other tools like a torch, wrench, cutting tools or even a weapon, they added. The robot could be used to disable satellites belonging to foreign powers, remove

components from them or glean other technical secrets.

The team said the biggest challenge was developing precise and reliable sensors for the robot's arms as some of functions required for tasks like docking can be problematic in zero gravity.

## **China plans to launch rockets into space from massive freighters and planes**

Starting next year, China Aerospace Science and Technology Corporation (CASTC) will use 10,000-ton freighters as ocean-going launchpads for its Long March 11 launch rocket. The Long March 11 can carry up to 1,100 pounds into low-earth orbit. The plan is to bring the freighters to the equator, so the rockets require less fuel and can accommodate larger payloads. Another alternative is from the air. The China Academy of Launch Vehicle Technology announced that they're developing a solid-fueled space launch rocket to be dropped from the Y-20. The rocket itself is expected to weigh about 60 tons (the Y-20's payload is 66 tons) and has a low Earth orbit payload of 220 pounds.

If you're dropping a rocket from an airplane, as opposed to the launching from ground, the rocket's first stage can be smaller, which means it'll be more efficient and could handle a larger payload. That means greater flexibility and a potentially quicker launch—both considerable military advantages

## **Long March 7 launcher**

The most powerful Chinese launch vehicle Long March 7 rocket was successfully launched from the Wenchang Satellite Launch Center in June 2016. The Long March 7 rocket is expected to become a workhorse in China's future space endeavors as it is suitable for a number of different applications – launching heavy craft up to 13,500 Kilograms into Low Earth Orbit and lifting medium-sized communications satellites up to 595

metric tons into Geostationary Transfer Orbit.

Long March 7 rocket also carried the Roaming Dragon satellite into space, officially, a space-junk collector. Its job, according to Beijing, is to pluck old spacecraft and large pieces of junk out of high-traffic orbits and safely plunge them back to the planet's surface. "China, as a responsible big country, has committed to the control and reduction of space debris," Tang Yagang, a scientist with the China Aerospace Science and Technology Corporation, wrote on the Chinese space agency's website.

However, Roaming Dragon's highly extendable and maneuvering robotic arm can also perform nefarious activities like dismantling or deorbiting satellites of other countries. "Space robotic arms, like many other space technologies, have both military and non-military applications, and classifying them as a space weapon depends on the intent of the user, not on the inherent capabilities of the technology," Kevin Pollpeter, deputy director of the Study of Innovation and Technology in China Project at the University of California, San Diego,

## **China tested hypersonic technologies in Long March 7 flight**

It is envisioned that CZ-7 will become the primary launch vehicle to lift cargo craft into orbit to resupply China's upcoming modular space station and eventually take over the crewed space program once the next-generation crewed spacecraft is ready for flight. A common element of all three new launchers is the YF-100 engine, switching from toxic propellants to Kerosene & Liquid Oxygen – a mix providing a higher performance while being friendlier to the environment. The light-lift Long March 6 debuted last year, CZ-7 flying for the first time and Long March 5 set for launch later in 2016

cover the entire spectrum of launch needs foreseen in the future – from crewed Low Earth Orbit missions, satellite launches into Sun Synchronous and Geostationary Transfer Orbits, and missions beyond the bounds of Earth's gravity.

Only very little is known about the payloads of the first Long March 7 flight. Hidden under the vehicle's fairing was a scaled-down version of China's future crewed spacecraft, a ballast mast and at least three small satellites including The Star of Aoxiang, a 33-Kilogram CubeSat-class satellite.

The so-called re-entry capsule looks similar to China's hypersonic glide vehicle DF-ZF," said Antony Wong Dong Macau-based military observer, "The colour of the capsule also indicated the use of a new, heat-resistant coating for a hypersonic vehicle." The researchers said that apart from gains in coating technology, the capsule's test run confirmed advances in reusable spacecraft, in-flight systems to gather thermal and aerodynamic data, and communications during re-entry.

Chinese DF-ZF (previously designated as the WU-14) is a hypersonic missile delivery vehicle that has been flight-tested by the Chinese seven times, on 9 January, 7 August and 2 December 2014; 7 June and 27 November 2015; and again in April 2016. The strategic strike weapon is extremely advanced and can travel at 10 times the speed of sound, or 12,231.01kph. Also, American defense officials said the vehicle, which speeds along the edge of the earth's atmosphere, demonstrated a new capability during the latest test: that it was able to take evasive actions.

DF-ZF could be used for nuclear weapons delivery but could also be used to perform precision-strike conventional missions (for example, next-generation anti-ship ballistic missiles), which could penetrate "the layered air defenses of a U.S. carrier strike group. Once operational, these missiles would make current strategic missile defenses systems obsolete, they

will be able to avoid triggering early-warning systems or detection by radar as well their speed shall complicate interception. Wong said that overall, the launch suggested China's ballistic missile technology was entering a new stage that aided the development of the DF-26 intermediate-range ballistic missile and the "carrier-killer" DF-21D, which could threaten US military installations on Guam.

## **Space plane is being developed as space weapons launch platform**

A Chinese military expert disclosed that a Chinese space plane known as the Shenlong will likely be deployed with the newly formed Strategic Support Force, the PLA's new high-technology warfare unit. A Jan. 8 report in Hong Kong's Tung Fang Jih Pao quotes official military commentator Song Zhongping as saying the Strategic Support Force will be made up of an Internet Army, an Aerospace Army and Electronic Warfare Troops.

Song went on to say that the new force would be equipped in the future with the Shenlong space plane that is capable of traveling in both space and air. The plane is said to be China's version of the Pentagon's experimental X-37B space plane. According to Song, the unmanned Shenlong is being developed as space weapons launch platform, as well as for surveillance, intelligence and early-warning missions.

The Shenlong – Divine Dragon – employs high speed with maneuverability and radar-evading stealth features. It will be capable of long-range flight. Shenlong (神龍/Divine Dragon) spaceplane's test flight has been completed on 8 January 2011, according to Chinese-language media outlets.

## **Space Station for Military use**

China and Argentina have worked on a deal to build space station years ago. 'Deep space station' that is being built in the Patagonia region could have more focus on military than space exploration. 'Political analyst Rosendo Fraga, director of the consulting firm New Majority, told the BBC that the base would have be used by the Chinese military. But officials in China have said the facility would be 'totally civilian, and it is not operated by military personnel.'

## **China's Moon Exploration program**

China has confirmed it will attempt an unprecedented robotic landing on the far side of the Moon in 2018. The Chang'e-4 mission will involve launching a relay satellite in June 2018, followed by a lander and possibly a rover at the end of the year.

China has launched its first round-trip mission to the moon called the Chang'e 5 Test 1 mission (CE5-T1) with a robotic spacecraft. "The mission is to obtain experimental data and validate re-entry technologies such as guidance, navigation and control, heat shield and trajectory design for a future touch-down on the moon by Chang'e-5, which is expected to be sent to the moon, collect samples and return to Earth in 2017," iCrossChina reported.

This launch shall also test "skip re-entry", technique that uses one or more atmospheric dips to slow the vehicle and avoid the most extreme temperatures generated by atmospheric friction. This technique requires precise flight control and alignment. These technologies shall enable future Chang'e-5 mission that involves putting a large lander on the moons capable of collecting up to 2 kilograms (4.4 lb) of lunar samples and returning them to the Earth.



These launches are part of Chinese Lunar Exploration Program (CLEP) also known as the Chang'e program, is an ongoing series of robotic Moon missions by the China National Space Administration (CNSA). The program incorporates lunar orbiters, landers, rovers and sample return spacecraft, launched using Long March rockets.

China's growing space ambitions are targeted towards future economic development and strategic advantage. Ouyang Ziyuan, a prominent Chinese geologist and chemical cosmologist, was among the first to advocate the exploitation not only of known lunar reserves of metals such as titanium, but also of helium-3, an ideal fuel for future nuclear fusion power plants.

The Chang'e 3 mission, launched on 1 December 2013 , included lander and China's first lunar rove called Yutu ("Jade Rabbit"), which successfully soft-landed on the Moon. The rover's designer, Shanghai Aerospace Systems Engineering Research Institute, claims several technological advances include its "autonomous" navigation system and the way the wheels are able to grip the powdery surface of the moon. It can climb inclines of up to 30 degrees and travel up to 200 metres (yards) per hour, according to the institute. Yutu, a 140 kg (310 lb) lunar rover is designed to explore an area of 3 square kilometres (1.2 sq mi) during its 3-month mission.

In addition, these launches are also giving thrust to the development of powerful heavy-lift rockets, capable of delivering large spacecraft to Earth orbit and beyond. On 15 July 2013, the LongMarch 5 – the rocket engine that will power the country's planned space station – was successfully test-fired.

Through these missions, Chinese researchers plan to master many key technologies that could give it strategic advantages, including autonomous navigation and high-speed communication systems for deep space, as well as fuel cells and atomic

generators to power the spacecraft. China's space exploration programme, aims to create a permanent space station by 2020 and it could have astronauts on the moon's surface by 2025, according to experts.

## **Growing China's Military space capabilities**

China continues to develop a variety of capabilities designed to limit or prevent the use of spacebased assets by adversaries during a crisis or conflict, including the development of directed-energy weapons and satellite jammers. "As China's developmental counterspace capabilities become operational, China will be able to hold at risk U.S. national security satellites in every orbital regime," says 2015 Report to Congress.

China has conducted a flight test of a new anti-satellite missile, the Washington Free Beacon reports. The test of a so-called Dong Neng-3 missile occurred on October 30 2015 at the Korla Missile Test Complex in western China. According to the Hong Kong-based newspaper Ming Pao the "final-phase missile interception test had been conducted in the upper atmosphere." However, in the past, China has repeatedly tried to disguise anti-satellite tests as missile defense interceptor tests. Since 2005, China has conducted eight anti-satellite tests. Tests conducted in 2010, 2013, and 2014 were labelled "land-based missile interception tests."

"On July 23, 2014, China conducted a space launch that had a similar profile to the January 2007 test that resulted in the deliberate destruction of a defunct weather satellite, and the creation of hundreds of pieces of long lived space debris. Much of that debris continues to orbit the Earth where it poses a risk to the safe operation of many nations' satellites. China's 2014 launch did not result in the

destruction of a satellite or space debris.”

On May 13, 2013, China launched ballistic missile (DN-2) on a ballistic trajectory with a peak altitude above 30,000 km. This trajectory took it near geosynchronous orbit, where many nations maintain communications and earth sensing satellites. It could, however, have been a test of technologies with a counterspace mission in geosynchronous orbit.

For space-based weapons, China reportedly is developing co-orbital anti-satellite weapons, which move close to satellite targets and then deploy weapons to disable or destroy them. According to the final report by the US-China Economic and Security Review Commission, the Chinese simulated such an attack in 2008 when it sent a miniature imaging satellite within 28 miles of the International Space Station without notification. China believes demonstrating its capability to damage or destroy satellites deters adversaries, the report states.

## **Chinese Counterspace strategy**

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PLA writings emphasize the necessity of “destroying, damaging, and interfering with the enemy’s reconnaissance ... and communications satellites,” suggesting that such systems, as well as navigation and early warning satellites, could be among the targets of attacks designed to “blind and deafen the enemy.” PLA analysis of U.S. and coalition military operations

also states that “destroying or capturing satellites and other sensors ... will deprive an opponent of initiative on the battlefield and [make it difficult] for them to bring their precision guided weapons into full play.”

China’s continued development of destructive space technologies represented a threat to all peaceful space-faring nations,” according to the report.

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