Centre for Air Power Studies (CAPS)
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CHINA'S SPACE LAUNCH FACILITIES

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Since the start of 21st century China has expanded its space programmes and has made noteworthy achievements in space sciences. As of August 2015, China has a total of 142 operational satellites[1] covering civil and military applications. The Chinese space programme besides providing services across a wide range of services includes robust interplanetary exploration missions and manned space missions. Over the last decade, as shown in figure.1 below, China has steadily increased the number of satellites as well as frequency of its satellite launches. As China plans to expand its space presence further, it has invested considerably in development of powerful rockets to carry heavier payloads in the orbit. The development of its Long March-5 (LM-5) rocket is near completion and is undergoing final phases of assembly and testing. LM-5 is expected to carry a payload in excess of 25 tons in LEO which is three times more than the present most powerful rocket LM-3B with a payload capability in the range of 8 tons.

As China steps up its orbital launches, it is also expanding on its launch capabilities. Presently, it has three operational satellite launch centres at Jiuquan, Taiyuan and Xichang. To augment its launch facilities, it has now constructed a new base at Wenchang, Hainan Province (refer Figure 2). These launch facilities are supported by a network of telemetry, tracking, and control (TT&C) stations.

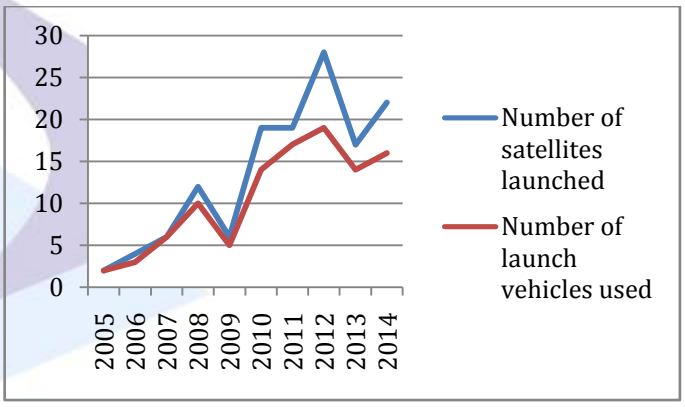

Figure 1. Number of successful satellites launched by China[2]

Jiuquan Satellite Launch Centre

The Jiuquan Satellite Launch Centre was established in 1958 in the Gansu province with Soviet assistance and is the country's earliest and largest launch site credited with maximum number of space launches and experimental

evaluations.[3] Spread over an area of about 2,800 square kilometres, the launch centre caters for spacecraft launches into low, medium and high earth orbits. Its facilities are state of the art to include a Technical Launch Complex, the Launch Control Centre, the Mission Command and Control Complex and other logistical support systems.[4]

Figure 2. Launch sites[3]

The launch centre became operational on November 5, 1960 when China launched its first surface to surface missile (R2) and in year 1966 the countries first and only missile-delivered nuclear test was launched from here on a DF-2 missile.[5] The first artificial satellite Dong Fang Hong 1 was launched from this centre in 1970 and by 1998, 33 satellites had been launched from Jiuquan with a 100 percent success rate.[6] Thereafter, the launch pads at this sites were augmented for heavy lift capacity and was used for Shenzou series of spacecrafts resulting in first manned space mission Shenzhou 5 on October 15, 2003.[7] This was followed up with manned space missions Shenzhou 6 on October 12, 2005 and Shenzhou 7 on September 25, 2008 aboard Long march series of rockets.[8] In addition, China has launched a space laboratory module Tiangong-1 in September 2011 and has followed it up with manned and unmanned docking practices using Shenzhou series of spacecrafts. While still controlled by the military, Jiuquan is primarily used as a launch site for China's civilian satellites and manned space program.

Taiyuan Satellite Launch Centre

The Taiyuan Satellite Launch Centre (TSLC), located near Taiyuan, Shanxi Province was established in March 1966 and became operational in year 1968.[9] The launch centre operates a single launch pad that caters for satellite launches into sun synchronous and low Earth orbits of meteorological, remote sensing, and communications satellites.

The centre consists of a launch site, a command and control centre, and a technology testing area. TSLC is also a major launch site for ICBMs and overland Submarine-Launched Ballistic Missile (SLBM) tests.[10]

Xichang Satellite Launch Centre

Located in the southwest China's Sichuan Province, the Xichang Satellite Launch Centre (XSLC) under the jurisdiction of the People's Liberation Army was established in the year 1970 and has been designed to launch powerful thrust rockets and geostationary satellites since it became operational in 1984.[11] Suited for launching satellites from October to May, it is

equipped with two launch pads that cater for the launch of geostationary communications and meteorological satellites by Long March series of rockets. XSLC was also the launch location for the Anti-satellite test that destroyed the Feng Yun 1C polar orbiting weather satellite on January 11, 2007 and its lunar mission involving launch of un-manned Moon orbiter Chang'e-1 on October 24, 2007.

In late 2007, the PRC government announced its plan to build a new space centre on the southern Hainan Island to eventually replace XSLC as the launch site for geostationary orbit and lunar missions. Chinese state-run media reported that once the new launch centre is fully operational by the year 2016, XSLC will become a backup launch site.[12]

Wenchang Satellite Launch Centre

Wenchang Satellite Launch Centre (WSLC) is being built as the fourth and the southernmost space vehicle launch facility. The spaceport located in Hainan province of China has been specially selected for its low latitude, and will allow for a substantial increase in payload over the existing capacity of XSLC.[13] The increased payload capability will provide a boost to the Chinese space projects.

As per available reports the infrastructure and facilities required for the launch site have been readied and preliminary evaluations of technicalities required for rocket launch are in progress. As per chief engineer of the XSLC, the launch site will be able to cater for 10 to 12 launches annually and will enhance the comprehensive strength of China's aerospace industry.[14] The Chinese are planning to launch their largest ever rocket, the Long March 5 in 2016 from this launch site.[15] Long March 5 family will be used for robotic and human spaceflight missions, including launching modules for the country's space station, which is expected to be completed before 2023.[16] China also plans to launch its ambitious Chang'e-5 lunar mission, which aims to put a lander on the Moon and return samples to Earth in 2017.[17]

Telemetry, Tracking, and Control (TT&C) network[18]

China has established an advanced TT&C network of ground and ship based stations to monitor and control its satellites and spacecrafts. This network has acquired the capability of sharing TT&C resources with international network, and its technology has reached the international advanced level. The two control stations are at Xian (Satellite Monitor and Control Centre) and Beijing (Aerospace Command and Control Centre). It has more than 20 tracking ground stations and also has tracking facilities set up in Pakistan, Kenya and Namibia. Additionally, it has Satellite Maritime Tracking and Control (SMTC) that uses four Yuan Wang tracking ships stationed in international waters.

As China galvanizes its space support with positioning more satellites and spacecrafts, it is working diligently in carving out its futuristic

goals aimed at emerging as a global power. It seeks to derive strategic advantage from its space technology, where in the space support would be pivotal to its economic and military growth.

(Disclaimer: The views and opinions expressed in this article are those of the author and do not necessarily reflect the position of the Centre for Air Power Studies [CAPS])

Notes

[1] "UCS Satellite database", at http://www.ucsusa.org/nuclear-weapons/space-weapons/satellite-database.html#.VjCUnNIrLow accessed on October 28, 2015

[2] Compiled from "UCS Satellite database", at http://www.ucsusa.org/nuclear-weapons/space-weapons/satellite-database.html#.VjCUnNIrLow accessed on October 28, 2015

[3] " Jiuquan", at http://www.china.org.cn/english/features/cslc/140043.htm accessed on October 27, 2015

[4] "Jiuquan Satellite Launch Centre", at https://en.wikipedia.org/wiki/Jiuquan_Satellite_Launch_Centre accessed on October 27, 2015

[5] "Jiuquan Space Launch Centre", at http://www.nti.org/facilities/71/ accessed on October 27, 2015

[6] "Launch records", at http://www.china.org.cn/english/features/cslc/139839.htm accessed on October 27, 2015

[7] Ibid and "Jiuquan Space Launch Centre", at http://www.nti.org/facilities/71/ accessed on October 27, 2015

[8] ibid

[9] "Taiyuan", at http://www.china.org.cn/english/features/cslc/140092.htm accessed on October 27, 2015

[10] "Taiyuan Satellite Launch Centre", at https://en.wikipedia.org/wiki/Taiyuan_Satellite_Launch_Centre accessed on October 27, 2015

[11] "Xichang", at http://www.china.org.cn/english/features/cslc/140096.htm accessed on October 27, 2015

[12] "Xichang Satellite Launch Centre", at http://sinodefence.com/space-program/xichang-satellite-launch-centre/ accessed on October 28, 2015

[13] "Wenchang Satellite Launch Centre", at https://en.wikipedia.org/wiki/Wenchang_Satellite_Launch_Centre accessed on October 28, 2015

[14] Beijing Review, "A new window to space", at http://gbtimes.com/life/new-window-space accessed on October 28, 2015

[15] Andrew Jones, "China's largest ever rocket cleared for 2016 launch after completing tests", at http://gbtimes.com/china/chinas-largest-ever-rocket-cleared-2016-launch-after-completing-tests accessed on October 28, 2015

[16] ibid

[17] ibid

[18] Chinese Space Facilities, at http://www.globalsecurity.org/space/world/china/facility.htm accessed on October 29, 2015