

Space is a war fighting domain and all major powers US, Russia and China are developing Anti Satellite Weapons

“Space is not a sanctuary, it is a war fighting domain,” US Air Force Brigadier General Mark Baird said at the Defense One Tech Summit. US, Russia and China are reportedly pursuing development of space weapons secretly. Congress added more than \$32 million to the Air Force’s space budget in fiscal 2015 to study future antisatellite capabilities, including offensive and “active defense” capabilities. It also instructed DOD to “conduct a study of potential alternative defense and deterrent strategies in response to the existing and projected counterspace capabilities of China and Russia.”

Concerns have grown in the aftermath of Chinese antisatellite tests, most recently in July 2014, that demonstrated the capability to destroy military communications satellites, perhaps even those in geostationary orbits. Since 2005, China has conducted eight anti-satellite tests. Tests conducted in 2010, 2013, and 2014 were labelled “land-based missile interception tests.” “There have been additional tests that didn’t destroy a satellite since that time.” Secretary of the Air Force Deborah Lee James said at the Space Symposium in Colorado Springs, Colorado: “The testing has continued, so that is an ongoing concern, something that we are watching.”

Russia is also a cause for concern, she added. In May 2014, it launched three communication satellites, along with a fourth spacecraft that is maneuvering between higher and lower orbits and sidling up to other objects. Russian Nudol missile tests

which Moscow has claimed is for use against enemy missiles, are ASAT tests according to reports.

Compared to both Russia and China, US Military is more dependent on space assets, hence more vulnerable to ASAT weapons which are regarded as important asymmetric warfare weapons.

US Navy itself shot down a satellite in 2009, stated to be in danger of falling out of earth's orbit at 133 miles and traveling at 17,000 mph with an SM-3 missile, which the US military fields hundreds of. Recently the ageing US Defense Meteorological Satellite Program Flight 13 (DMSP-F13), is said to have suffered a "catastrophic event" due to which it exploded into 43 unsalvageable pieces. Furthermore the "catastrophic event" happened after "a sudden spike in temperature," followed by "an unrecoverable loss of attitude," According to the US Air Force.

The incident was not revealed to the public even though it happened on 3 February. Details of the event were only publicized after questions were asked by the Space News website. The first public indication of a problem with DMSP-F13 came from T.S. Kelso, a senior research astrodynamacist for Analytical Graphics' Center for Space Standards and Innovation in Colorado. He noted that in 25 February that there had been "another debris event with 26 new pieces". The more plausible theory is that it was an US ASAT test, either of laser ASAT weapon or killer microsatellite.

The U.S. Air Force, under pressure from Congress to take more seriously a potential war in space, is creating a new job for a three-star general who will serve as a space advisor on staff with the Air Force secretary and chief of staff. The new general will "come to work every day focusing on this: making sure that we can organize, train, and equip our forces to meet the challenges in this domain," said Gen. Jay Raymond, head of

Air Force Space Command.

Russian ASAT Capability

Russia successfully flight tested a new missile capable of knocking out strategic U.S. communications and navigation satellites, according to Pentagon officials. The test of the PL-19 Nudol missile was carried out Dec. 16 from a base in central Russia, and was monitored by U.S. intelligence agencies. It was the fifth test of the Nudol missile and the third successful flight of a system Moscow has claimed is for use against enemy missiles, said officials familiar with the reports of the launch. Earlier tests took place May 24 and Nov. 18, 2015.

The Nudol is viewed by the Pentagon as a so-called "direct ascent" anti-satellite missile. Russia, however, has sought to mask the missile's anti-satellite capabilities by claiming the missile is for defense against incoming ballistic missiles. Pentagon spokeswoman Lt. Col. Michelle Baldanza declined to comment. "We generally don't comment on other countries' capabilities," she said.

"It is unclear whether or not it was an ASAT test," according to Theresa Hitchens, senior research scholar at the Center for International & Security Studies at the University of Maryland. However it also could be part of the Russian military's missile defense system. "Of course, any ballistic missile used for missile defense could also be used as an ASAT," she added. "Perhaps the answer lies in the eyes of the beholder."

Russian Lt. Gen. Oleg Ostapenko, former commander of space forces, has claimed that the S-500 anti-missile system is capable of hitting "low-orbit satellites and space weapons."

China's Counterspace 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 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. Analysis of the launch determined that the booster was not on the appropriate trajectory to place objects in orbit and that

no new satellites were released.

The launch profile was not consistent with traditional space-launch vehicles, ballistic missiles or sounding rocket launches used for scientific research. It could, however, have been a test of technologies with a counterspace mission in geosynchronous orbit. The United States and several public organizations expressed concern to Chinese representatives and asked for more information about the purpose and nature of the launch. China thus far has refrained from providing additional information

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.”

In September 2006 the U.S. publication Defense News, citing unnamed U.S. officials, was the first to report that China had used ground based lasers to “dazzle” or blind U.S. optical surveillance satellites on multiple occasions.

Possible Chinese confirmation of their ground-based laser testing appeared in the December 2013 issue of Chinese Optics was an article titled “Development of Space Based Laser Weapons” written by Gao Min-hui, Zhou Yu-quan and Wang Zhi-hong, all from the Changchun Institute of Optics, Fine Mechanics and Physics. It is one of China’s leading institutes for the development of civil and military application laser technology. The article states: “In 2005, we have successfully conducted a satellite blinding experiment using a 50-100 KW capacity mounted laser gun in Xinjiang province. The target

was a low orbit satellite with a tilt distance of 600 km. The diameter of the telescope firing the laser beam is 0.6 m wide. The accuracy of ATP (acquisition, tracking and pointing) is less than 5 microradians.

This would constitute militarily useful performance; an accuracy sufficient to track a large number of Low Earth Orbit (LEO) surveillance satellites and to degrade their optical imaging systems. A "tilt" distance of 600km means it can reach higher if the target passes closer to the laser. While the target satellite for the 2005 test was not identified, the ground-based laser was likely located in Korla, Xinjiang Province. Starting with the 640 Program, Korla has hosted a major base deeply involved in testing China's anti-missile and anti-satellite weapons, writes Richard D. Fisher, Jr. Senior Fellow, International Assessment and Strategy Center.

ASAT testing is probable causes of US Satellite failure

The satellite failure could be triggered by natural causes like collision with debris or space weather degradation or The collision with debris larger than 10 cm has the potential to cause complete destruction of satellite, like that happened. However the US operates one of the world's largest Space Surveillance Network (SSN) to detect, track and identify objects orbiting earth. It maintains the most complete tracking database of 23,000+ space objects bigger than 10 cm. Therefore the theory that destruction from collision with space debris is very unlikely.

The other natural cause is space weather degradation, which can impact satellite degradations through surface charging or electrostatic discharge, degraded solar panels, Phantom commands, data corruption, power loss e.t.c. On 2nd february

2015, there was Class C minor solar flare as well as level G1 minor geomagnetic storm, both minor events unlikely to result in catastrophic failure. Moreover US also operates comprehensive space weather monitoring and forecasting infrastructure, incidentally the destroyed satellite was itself part of space weather monitoring DMSP satellite constellation. Moreover destruction by natural causes is unlikely to result in such delayed US response in revealing the event.

The more plausible theory is that it was an ASAT test, either of laser ASAT weapon or killer microsatellite. "The United States will proceed with development of an anti-satellite (ASAT) capability, with operational deployment as a goal. The primary purposes of a United States ASAT capability are to deter threats to space systems of the United States and its Allies, and within such limits imposed by international law, to deny any adversary the use of space-based systems that provide support to hostile military forces." As enunciated by President Ronald Reagan in National Space Policy, July 1982

Depending on their power, lasers can damage, disrupt, or destroy a satellite by overheating its surface, puncturing the outer surface of the spacecraft to expose internal equipment, or by blinding critical on-board mission or control sensors. Microsatellites carrying hard-kill or soft-kill payloads can permanently or temporarily disable a large satellite. One of the most effective threats from a micro-satellite is in the form of a 'space mine'. The microsatellite is covertly deployed and attached to the satellite, which can then be remotely commanded to destroy the host satellite.

The large number of debris created by the explosion, both trackable and non-trackable, has enhanced the risk to the operational satellites in this orbit.

References and resources also include:

- https://www.uscc.gov/sites/default/files/Fisher_Combined.pdf
- <http://nationalinterest.org/blog/the-buzz/russia-might-have-just-tested-the-ultimate-weapon-war-18849>
- <http://nationalinterest.org/blog/the-buzz/russia-might-have-just-tested-the-ultimate-weapon-war-18849>
- <https://defensesystems.com/articles/2015/05/01/antisatellite-race-china-russia.aspx>
- http://www.defenseone.com/politics/2017/04/air-force-reorganizing-fight-space/136733/?oref=defenseone_today_nl