Space Weaponization and Future Threats of Satellite Nuclearization

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Abstract

Recent days, space technology notched up to pinnacle of research and development work. It controls various aspects of our life, including international communication, online banking, live worldwide broadcasting, navigation, weather forecast and guiding millions of travellers around the world. Moreover, militaries of many countries have used space technology via satellites to guide missiles and develop early warning systems with the aid of Global Positioning Systems. World powers have been utilizing the latest space technologies for military purpose to maintain their supremacy. At the moment, no weapon has been put in the orbit around earth. The treaties signed in the past for the subject matters are not well enough to restrict world powers from initiating a new weapons race. It is a high time for the entire world to take necessary steps to restrict the initiation of this new arms race; moreover it is to be ensured that no nation will initiate similar projects at its own in the name of its "national interest". It is suggested to conduct researches and debates to bring awareness among masses and policy makers all around the world to consider space weapons and satellite nuclearization as a major threat to humanity and make worldwide policies to avoid it. Global issues, such as to deal with near earth objects (NEO) in space, may force to place nuclear weapon in space, therefore, should be resolved with the consent of all the nations.

Keywords

Space Weaponization, Nuclearization, Outer Space, Arms Race

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Introduction

It is true that science and technology are mainly responsible for today's comfortable life. Mankind has developed science to form new technologies to face the challenges of modern life. That is why world is spending a lot of resources to continue the research and development work in the area of information technology; One can imagine that in 2014, the budget spending worldwide on information technology is USD 3.5 trillion and it's increasing at the rate of 6% each year (VanRoekel, 2014). Science and technology are being used to ensure environment stability, elevate lifestyle, eradicate poverty and hunger and promote peace in the world. On the other hand, whenever man has developed new technologies; he tried to utilize them in wars. Particularly, the world powers have pursued latest technologies to utilize them for military purpose. To maintain their power and ensure supremacy over other states and countries, they use the latest technologies for their defence and attack capabilities. In past, behind the scene of peaceful use of atomic energy, U.S developed atomic bomb and dropped it on Hiroshima and Nagasaki (Angelo, 2003). Similarly, the scientific development of weapons of mass destruction such as nuclear, radiological, biological and chemical weapons (Rosenberg, 2015) opens our eyes to how states have used scientific developments in wars to plan the destruction of humanity in the craze of military domination. The destruction in the two world wars is among some examples of the use of similar technologies against mankind to ensure the supremacy of power.

The initiative of atomic power was purely for scientific research. At start, it was thought of as a source of energy and many countries are using nuclear technology to produce electricity on large scale. There are almost 440 operable nuclear power plants being used by countries in the world to provide energy (Nuclear Power in the World Today, 2014). These are producing 11% of total world energy needs. In contrast, according to federation of American scientist, there are approximately 15800 nuclear war heads present in the world (Status of World Nuclear Forces, 2014). After the horrified incidence of Hiroshima and Nagasaki, it is believe that the spread of nuclear weapons is for survival and defence purposes. If the world powers had not made nuclear weapons,

there might have not been any chance of proliferation of nuclear weapons and hence have neither caused any destruction nor a threat of nuclear war. If we look back to the 20th century, the use of nuclear and chemical weapons, and missile makes it clear that primary goal of development of nuclear, space and other technologies is to develop such lethal weapons for military purpose in other words, the craze of becoming world power brought some countries to a point that they have made enough weapons to destroy the entire planet within a few minutes. The development of latest weapons opens a door towards a new arms race. When one nation achieves such goals, it's natural for other nations to do the same to maintain the balance of power for their survival and to maintain their sovereignty. Beyond these threats to humanity, a lot of resources have been spent to make weapons of mass destruction from nuclear and other modern technologies for military use; instead of that, pure scientific research has not been carrying forward to benefit mankind and use in industry to overcome poverty. In 2014, the world military expenditure was about 1776 billion United States Dollars. And among this huge amount, the share of the United States was greater than 610 billion USD (Perlo-Freeman, Fleurant, Pieter Wezeman, & Siemon Wezeman, 2015).

History of Outer Space Exploration

What is outer space? It is the region, 100-120 km above the earth's surface (Spence, 2011). It seems very close to earth but to reach that zone i.e. to overcome the gravitational pull, an object should move at a velocity greater than 28,000km/hr (Angelo, 2003). Therefore, it requires a large amount of energy and precision guidance to put objects in outer space in specific orbit around the earth. Outer space includes moon or other celestial bodies and is considered as the province of all mankind. Therefore, all nations are free to explore outer space for conducting modern scientific research to boost their economy and benefit entire mankind (Moltz, n.d.; Outer Space Treaty [OST], 1964). The exploration of space is based on principles of physics. Engineers have made use of scientific laws for space exploration. In the early 20th century, it was the dream of mankind to go in space and explore the hidden beauty of nature in the heavens above (Maini & Agrawal, 2010). The great motivation

towards this technology was the formation of rockets. After the Second World War (WWII), USA and Soviet Union pursued development of missile technologies to become super powers. The Germans carried out a great amount of research and succeeded in forming rockets and missiles including V-2 missile (Collins, 1999). After WWII, during the cold war era, USA and USSR brought the German technologies under consideration and began to develop space technology, only to compete in the race of becoming a leading super power.

The quest of space exploration took speed in the 1950s as both the United States and the Soviet Union announced plans to launch earth-orbiting artificial satellites. A satellite is any natural body orbiting any other natural body. So, the manmade satellites, that orbit the earth, were distinguished by being called artificial satellites. But later on, the word satellite was used for artificial satellites (MsGowen, 2009). From 1954 to 1957, the Soviet Union succeeded in the development of the world's first intercontinental ballistic missile (ICBM) that was able to attack USA with nuclear warheads as well as was able to launch space crafts into space. Then in October 1957, the Soviet Union launched the world's first artificial satellite. To overcome the edge of the Soviet Union in space technology, USA launched its first state of the art satellite in orbit on January 31st 1958 (Bennett, 2006; Collins, 1999). USA and the Soviet Union first announced intentions to place scientific satellites into orbit for carrying out scientific research and gather information about the solar system etc. (Collins, 1999). Therefore, for this purpose United States formed the National Aeronautics and Space Administration (NASA) in 1958 (Bennett, 2006). In 1961, Soviet Union launched the first human into space. A few days later, NASA also succeeded in sending an astronaut into space (Angelo, 2003). The US provided the base for modern communications via satellites when it launched the project 'Signal Communications Orbit Relay Experiment' (SCORE) on December 18, 1958 (Angelo, 2003). It was used for the first time to relay human voice from space to earth through a communication satellite that receives signals from earth and then sends it back to earth after processing (McGowen, 2009). After this breakthrough, the process of communication through satellites commonly began. On April 1st 1960, the world's first weather satellite was launched by the US. Weather

satellites take images of clouds and record atmospheric parameters to make weather predictions (McGowen, 2009). On April 13, 1960, the US Navy launched its first experimental navigation satellite into the space orbit. It was designed for ships and submarines to precisely calculate their position in all weather conditions (Angelo, 2003). On June 29, 1961, USA launched its first nuclear-powered satellite 'Transit 4A' that used nuclear power to meet the high energy requirements (Biagi, 2011). On July 10, 1962, the first translational satellite broadcast was sent. In 1964, 18 nations formed INTELSAT to coordinate satellite communication. The Soviet Union developed the communication satellite 'Molniya 1A', and launched it into orbit on April 23, 1965. Later on, one after another nations launched their individual satellites for domestic communications and soon space became an important field for huge investments for both civil and defence purpose. The period from 1960 to 1989 is often called the first golden age of space exploration (Angelo, 2003) because in that period space technology was rapidly flourished compared to other technologies. In 2000, an orbiting laboratory for astronauts, named international space station was developed.

Recent Developments in Space Technology

Throughout history, engineers have applied different forms of technology to satisfy human needs. Space technology plays an important role in today's modern life due to the use of earth orbiting satellites for different purposes. Space technology – via satellites – controls various aspects of our lives for example communication, media, land measurement, surveillance intelligence, early warning systems, weather reports, etc. (Global Positioning System [GPS], n.d.). On the domestic level, the communication between very distant people is only a matter of seconds with the help of space technology. A lot of research is being carried out to utilize space technology in various fields of life e.g. in industry as information technology and for military purposes as well. Nowadays, economy of countries are boosting through online banking and real-time stock market information (GPS, n.d.). In addition to that, the GPS made and operated by the US government is playing an important role in the use of space technology in our daily lives (Krepon

& Black, 2009). It provides very precise measurements of position and time anywhere and anytime in the world under all weather conditions. It is being used vastly in the study of aviation, maritime guidance, public safety, railway tracking, roads, highways, further space exploration, mapping and the precise measurement of time. Furthermore, satellites provide many life-saving services including search and rescue operations, natural disaster damage assessment, disease tracking, hurricanes predictions, earthquake monitoring, emergency communications, and many others services. Additionally, they are also used to study climate and other weather changes, and manage agricultural production to increase crop yields (Weeden, 2013). Interestingly, it is found that more than 1300 operational satellites are present in outer space to collect and share data on daily basis for the smooth operation of the aforementioned applications**.** In 2014, the world satellite industry revenue was USD 203 billion which was a huge amount**.** Therefore, leading countries in this business such as USA increased their budget for NASA to USD 18.0 billion in 2015 which was USD 17.6 billion in 2014 (NASA FY 2016 Budget Request, n.d.). In recent days, it is thought that leading countries are not only involve in a number of space activities for peaceful commercial purposes to generate revenue but also utilizing them for military purposes.

Space Militarization

"Space Militarization" is a vast terminology with various aspects. It is different from other fields used for military purposes. It includes the use of space assets to help in attack on space assets from either earth or from space, attack on earth from space, guide weapons on earth from space, use of information technology for intelligence purpose and other military related use that involves space technology (Marshall, Whitesides, Schingler, Nilsen, & Parkin, 2005). Similarly, "Space Weapon" is also a broad terminology. A space weapon can be defined as the active use of space assets for attack or defence purposes. It includes a weapon placed in outer space, anti-satellite weapon (ASAT) and ground based jammers (Lowery, n.d.).

The initiative of space weaponization lies in the 1950s with the development of the first weapon to travel through space, the

Intercontinental Ballistic Missile (ICBM) (Collins, 1999; Wolff, 2013). The outer space arms race began in the period of the Cold War (Bauschard, 2013). After the launch of the first satellite, the militaries of USA and the Soviet Union launched many military satellites to attain power and technological edge over one another. These satellites were used mainly to acquire military information and intelligence (Marshall et al., 2005). Americans declared their right of self-defence in space for the first time in late 1970s and thus opened the way for heavy investments in space (GPS, n.d.). After the beginning of space militarization (Al-Rodhan, 2012), the US and Soviet Union both started developing ASAT and kinetic energy weapons (Lendman, 2010). Both superpowers achieved ground-based ASATs during the Cold War. The last ASAT test during the Cold War was carried out by USA in 1985. China tested multiple ASAT in last decade (Weeden, 2013).

On August 9, 1996, Commander-in-Chief US Space Command, Joseph W. Ashy asserted:

> It's politically sensitive, but it's going to happen. Some people don't want to hear this, and it sure isn't in vogue, but – absolutely – we're going to fight in space. We're going to fight from space and we're going to fight into space. That's why the US has development programs in directed energy and hit-to-kill mechanisms. We will engage terrestrial targets someday – ships, airplanes, and land targets from space. (Gray, 2005; Grossman, 2001; Johnson, 2003).

The statement was not just a political statement but it actually started happening. Currently, there are over 100 operational military satellites of U.S. are present in space orbit (Wolff, 2003). Worldwide coordination between U.S. military troops is the result of space technology. They use satellites from the strategic level to the level of the individual soldier, who may rely on satellites with infrared cameras to spot targets inside buildings. In Gulf war, U.S. utilized 25 satellites to precisely guide the weapons to attack targets in Iraq (Lambeth, 2001). After having successful use of space technology in Gulf war, most of the weapons used in 2003 Iraq war by NATO/U.S. militaries were satellite guided (GPS, n.d.). It is found that the number of satellites used in Iraq war was double compared to the number of satellites used in Gulf war.

GPS provides the latitude and longitude coordinates of the earth; these coordinates are utilized by the guided weapons to hit the targets with an accuracy of few meters. Attack on Yugoslavia in 1999 also demonstrated the power of space technology for military purpose where Operation Allied Forces used commercial satellites during their operations (Joint Direct Attack Munition [JDAM], n.d.; Lambeth, 2001). JDAM also known as the "War fighter's Weapon of Choice" is another example of use of space technology in wars. The JDAM is basically a near precision smart weapon or simply a guidance kit that allow unguided free-fall bombs to accurately drop near the target. This system also uses GPS for additional stability and lift. It has been used extensively in the second Iraq war and in some other operations as well (Callmers, 2008; Cordesman, 2003). For missile defence purpose, the satellites are being used in early warning systems to detect the enemy's missiles just after launch (Chatters & Eberhardt, 2009; Maini & Agrawal, 2007).

From the aforementioned discussions and examples, one can perceive the idea of dual use of satellite for both civil and military purpose (Wolff, 2003). Therefore, the use of space for military purpose, either directly by weaponization of space or for civil use by instant sharing of data via space, may raise threats to the world of an untoward and sudden accident which increases danger to humanity.

It is important to note that huge amount of resources are also being utilized for all the aforementioned space activities that should be spent for the benefit of mankind and to eliminate poverty. However, these resources are bringing the world into a new weapons race. Many countries, NGOs and various institutes are trying to highlight this issue via discussion and researches (Bauschard, 2013; General Assembly Meetings Coverage [GAMC], 2014; Grossman, 2000; Johnson, 2003; Lambeth, 2001; Lowery, n.d.; Outer Space, 2014; Wolff, 2003). Many are trying to raise awareness of the danger to humanity posed by such kinds of activities. But unfortunately, the leading countries speaking for peace and humanity are seriously involve in malicious utilization of space technology. Therefore, in this situation it is a tough task to stop the further exploration of space for military purposes.

Possible Avenues for Future Developments of Satellite Nuclearization

'Satellite Nuclearization' refers to the placement of nuclear weapons in space in particular orbits around the earth. Just as satellites orbiting the earth are controlled from earth, nuclear weapons can be put into orbit and controlled from earth to be used at any time to target from space into space or from space onto earth.

Many NGO's, think tanks, universities and people on an individual level are working to stop the use of space technology for military purposes by debates, conducting research, seminars and conferences and through other media for raising awareness.

The countries which have succeeded in the use of space technology for wars on earth are now looking forward to weaponize space. However, World powers may plan to put their nuclear weapons into orbits around earth. Thus, it may open a new door of space race for everyone in the form of satellite nuclearization. If one nation succeeds in launching nuclear weapon in space, i.e. this race starts and may be a point of no return for other nations. It is true that putting nuclear weapons in space requires very precise research work. It has to take into account many aspects to put weapons safely and keep them safe as well, but in the current age, when man is going to make colonies in space, it cannot be overlooked. As discussed earlier, many times when states set their targets to ensure their power supremacy by utilizing new technologies for military use, they first initiate such projects for peaceful purposes to present the other side of the picture. States also found excuses to initiate the formation of new weapons. Thus for satellite nuclearization, there also exist many excuses and there can be more. There are some matters being discussed on different forums nowadays that indicate the threat of satellite nuclearization in future.

For space exploration beyond Mars and far away from earth, nuclear technology is being considered for use on a large scale as a source of energy because it is the best source of energy discovered yet for use in outer space (Nuclear Power in Outer Space, n.d.). There is a limitation on sending the rocket to far distance based on liquid fuels or other kinds of fuel. For example solar energy is only limited to the area nearby the sun

(Brachet & Pasco, 2011). In the far away regions in space, the intensity of sunlight decreases, therefore solar power cannot be used as an efficient energy source. Whereas nuclear power one can enhance the speed as well as allow a space rockets to travel far away in space (Brachet & Pasco, 2011). A number of challenges and risks may involve in the execution and controlling of space-based nuclear projects (Jaramillo, 2011). For example one can imagine about the outcome of an accident happens, if a nuclear space rocket destroy in the mid-way to space. Similarly, risks are involved in the nuclear waste disposal to space. Therefore, in absence of abiding any reasonable space treaties and keeping in view the past history of peaceful use of nuclear technology, possibility of space-based nuclear weapons is there as R & D work is always behind the cover of similar aforementioned peaceful space projects. The Space is a vast area with many objects moving randomly in it.

There exist many Near Earth Objects (NEO) of different sizes and velocities. NEOs are asteroids and comets that lie in the area closer to earth. In the last few decades, a lot of researches have been conducted to identify NEOs. For example, NEOs, can be small (space debris) and large, have very high velocities that are very difficult to be detected. Since NEO moves at very high speeds, then even a size of one centimetre NEO can destroy a satellite (Bonsor, 2000; Moltz, n.d.). Therefore, threat of strike down a satellite by a NEO is always there. Gigantic NEOs can fall on Earth and destroy cities or some areas on Earth. Some groups argue for the use of nuclear weapons or missiles to destroy the NEOs in space before they fall on Earth (Bonsor, 2000). Hence, the issue of dealing with NEOs can also play a role in the start of satellite nuclearization era.

As argued above, satellites are playing an important role to strengthen the economic and military of a country. Therefore, there exist threats of attacks on satellites from rivals and local groups which may look to destroy the military networks and cause great damage to state interests (Butterworth, 2012; Lele, 2011). To ensure their national security, states may take steps toward space weaponization (Bauschard, 2013) in an attempt to create deterrent abilities. After the achievement of

ASAT, the space race has become more rapid. Many nations have achieved the ASAT technology and others are trying to attain it. Laser, jammer and other emerging devices in the space make the space objects less safe. The big powers are always looking to make them the safest. Therefore, they may head towards space weaponization and putting weapons of mass destruction into orbits in the name of safety (GAMC, 2014).

There may be some other possible excuses of big powers for proceeding with space weaponization and satellite nuclearization. Many of the possible excuses are also results of the use of latest technologies for military purposes by big powers e.g. to deal with space debris, ASATS, etc. The big powers started these weapons to have an edge on other states and once they make it, other nations also ran to catch up and hence achieved such weapons like ASAT. Most of the problems in space such as dealing with NEOs is an universal issue. Therefore, the act of using weapons by a single state evolves security problem for other nations. It seems that the purpose of space weaponization on a state level ensures the power supremacy and alarms the rest of the world that their space assets can be attacked from the earth. Recently, Russia planned to upgrade its ICBM system to hit asteroid 99942 Apophis, as they thought that it can impact Earth in 2036 during a near flyby (Russia's improved ballistic missiles to be tested as asteroid killers, 2016). However, NASA already ruled out the possibility of passing Apophis nearby Earth in 2036 (Dunbar, 2013). In addition to that, big powers of the world are also looking for space to save their nuclear weapons and may use them later when all the weapons on earth are useless or destroyed or even if they want to use their power as a deterrent from all opposition.

However, one nation putting weapons in space would imbalance space power and it would be natural for other nations to take the same step as it has been done in the past in the spread of nuclear weapons. It is very clear that in a polarized world, the act of one nation cannot be ignored by other nations. Therefore, it appears that a new space nuclear race can commence is near future.

To keep outer space exploration for peaceful purposes, the United Nations has passed many treaties like outer space treaty (OST, 1967).

According to the OST 1967, the stationing of nuclear weapons in outer space is prohibited (Bauschard, 2013). The United Nations has brought many treaties and passed many resolutions to keep outer space for peaceful purpose. But these treaties could not restrict the militarization of space. Currently many states have achieved many military goals from space technology as discussed earlier in the form of JDAM, ASAT, early warning systems, intelligence, etc. In 2002, the US withdrew from "Anti-Ballistic Missile" (ABM) for their national interest which was signed in 1972; to peruse the satellite based missile defence technology (GAMC, 2014). Therefore, the existing treaties to restrict world powers from space militarization are not much credible in the current situation.

The major threat to the world is that there will be no check and balance on the nations putting weapons in space to defend their space programs and national security. It is quite clear from history whenever their supremacy is challenged, they use these lethal weapons against their rivals just as in the past we have witnessed it.

Conclusion

After WWII, space has been explored by putting a large number of satellites into orbit around the earth. Space technology is playing an important role in advancement of our daily life. An era of industrial revolution has been started by utilizing space technology for communication, navigation and tracking, safety and rescue operations, etc. However, space technology has been vastly used for military purposes so we should promote its non-military use for the betterment of mankind. Therefore, all countries should be urged to achieve and contribute to the advancement in space technology and make efficient use of it on government as well as on commercial levels.

Currently, there is no solid action or treaties in world to stop the use of outer space for military purposes. Although there exist few treaties to ensure the use of space for only peaceful purposes but these failed to restrict world powers to remain within the limits of these treaties. World powers have demonstrated use of space assets in many wars and thus have forced other nations to adopt these technologies to maintain the balance of power.

Therefore, once this step is taken, it will be a point of no return for the de-weaponization of space. Global issues like to crush NEOs by placing weapons of mass destruction in space should not be handled unilaterally by one state; but jointly tackled by all capable states to avoid the misuse of these weapons. But how can we restrict super powers from placing weapons in outer space? This is an open question. Some people may say that there is no such possibility, but facts from the past are alarming: despite the opposition of all countries, North Korea conducted its fourth nuclear detonation on 6, Jan 2016. Whatever the case is, we have to conduct debate, research, conferences and seminars on this issue and force masses, key stakeholders like states and international organizations to take urgent steps to save humanity from threats of weapons of mass destruction.

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