



SPACE RACE BETWEEN US, RUSSIA AND CHINA

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Abstract

The cold-war era space race between the US and then USSR led to major space accomplishments and scientific inventions. The race helped fund major discoveries that has altered mankind's understanding of the space. Now, a new space race is afoot between three Global powers that look to dominate space exploration. The modern development of space technology like satellites will contribute for the improvement of military, environmental and exchange of communication and information across the world. Space power became a political tool between US, Russia and China for maintaining hegemony in the multipolar world order. This article provides a brief outlook on space race and competition between three major powers US, China and Russia in the post-cold war period.

Key Words: *Space Race, Cold-War, Space Exploration, Space Domination, and World Order.*

Definition of Space Race

According to the Collins Dictionary, the space race in the competition between the United states and the Soviet Union to be the superior power in outer space, in terms of exploration, manned space flights, and lunar landings; it is generally considered as beginning in 1957 and ending in the mid-1970s. Now it is generally used to refer to competition between nations for space exploration.

Man's perspective of space has never been the same after the launch of the Sputnik satellite. Not only has human exploration of space has increased, our knowledge regarding it has also surpassed levels. Space has now become a geopolitical frontier. Global powers like the US, China and Russia are trying to gain advantage of the economic and military avenues offered by space. Space is an area of national interest and security. Space and defense are tightly intertwined. The navy and air power of a country relies on satellite navigation. Countries are rushing to develop cutting edge space technologies like quantum-enabled military communications, spatial resolution images, ASAT missiles etc. Space is no longer just a matter of pride and competition but it is of global significance and sovereign security (Laureti, 2021).

Due to the increased activity in space, international laws and treaties have been made to offer little regulation of space activities. There are five international treaties in space law under the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS). These include the outer space treaty, the moon agreement, the rescue agreement, the liability convention and the registration convention.

The Outer Space treaty (Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies):

The principles of the treaty are as follows: (UN Office for Outer Space Affairs, 2021)

1. The exploration and use of outer space shall be carried out for the benefit and in the interests of all countries and shall be the province of all mankind;
2. Outer space shall be free for exploration and use by all States;
3. Outer space is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means;



4. States shall not place nuclear weapons or other weapons of mass destruction in orbit or on celestial bodies or station them in outer space in any other manner;
5. The Moon and other celestial bodies shall be used exclusively for peaceful purposes;
6. Astronauts shall be regarded as the envoys of mankind;
7. States shall be responsible for national space activities whether carried out by governmental or non-governmental entities;
8. States shall be liable for damage caused by their space objects; and
9. States shall avoid harmful contamination of space and celestial bodies.

The Rescue Agreement: Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space.

The Agreement, elaborating on elements of articles of the Outer Space Treaty, provides that States shall take all possible steps to rescue and assist astronauts in distress and promptly return them to the launching State, and that States shall, upon request, provide assistance to launching States in recovering space objects that return to Earth outside the territory of the Launching State (UN office for outer space affairs, 2021).

The Moon agreement: Agreement Governing the Activities of States on the Moon and Other Celestial Bodies
The Agreement reaffirms and elaborates on many of the provisions of the Outer Space Treaty as applied to the Moon and other celestial bodies, providing that those bodies should be used exclusively for peaceful purposes, that their environments should not be disrupted, that the United Nations should be informed of the location and purpose of any station established on those bodies. In addition, the Agreement provides that the Moon and its natural resources are the common heritage of mankind and that an international regime should be established to govern the exploitation of such resources when such exploitation is about to become feasible (UN Office for Outer Space Affairs, 2021).

The Liability convention: Convention on International Liability for Damage Caused by Space Objects.

Liability Convention provides that a launching State shall be absolutely liable to pay compensation for damage caused by its space objects on the surface of the Earth or to aircraft, and liable for damage due to its faults in space. The Convention also provides for procedures for the settlement of claims for damages (UN Office for Outer Space Affairs, 2021).

The Registration convention: Convention on Registration of Objects Launched into Outer Space

The Registration Convention expanded the scope of the United Nations Register of Objects Launched into Outer Space and addressed issues relating to States Parties responsibilities concerning their space objects. The Secretary-General was requested to maintain the Register and ensure full and open access to the information provided by States and international intergovernmental organizations (UN Office for Outer Space Affairs, 2021).

The End of World War 2 was supposed to bring peace and stability to the world but instead it gave rise to a new kind of conflict- the space race. The Space race is the cold war era competing rivalry between the United States (NASA) and Russia previously USSR (ROSCOSMOS) showcasing their space technology aiming to prove superiority. It was an outgrowth of the Second World War between conflicting ideologies of capitalism and communism to gain global dominance (Mann, 2019). The cold war between USA and Russia penetrated into arms race, nuclear weapons build-up, espionage and counter espionage, and clash of words. Beginning in the late 1950s, space became another arena during the cold war. The tensions between the two countries were exacerbated by the construction of Berlin wall, Cuban missile crisis and war in Southeast Asia throughout the space race. But the competition also led to some of the greatest innovations and technological development.



The new space race continues till date between the USA, China and Russia (Davis, 2020). Beijing has openly on several occasions revealed its space ambitions. With the rising tensions between the US and China politically and economically, space has become a new arena for the countries to compete (Cruz, 2021). China is openly challenging the US space domination with its space projects like the permanent Tiangong space station, Martian rover, Lunar space station, and crewed mars mission. The new space race is already afoot (Davenport, 2021).

Space Race during Cold-War Period

Soon after World War II, the United States and the Soviet Union became engaged in an international conflict pitting democratic capitalism against communism. Both the United States and Soviet Union successfully captured German scientists who were behind the long range guided ballistic missile system. During WW2, Germany invented the V2 rockets (Vergeltungswaffe 2). It was a ballistic weapon capable of bombing targets 80 kms away. The allies had no such technology. The United States had German scientist Wernher von Braun who fled the Nazi Germany to lead the US space program and the Soviet Union released Ukrainian born scientist Sergei Korolev, who was held under technical arrest, to resume his work for Russian space program. In 1955, both the USSR and the US announced that they would be launching satellites into orbit (Turner, 2014).

By August 1957, the Soviet Union successfully tested the R-7, the first intercontinental ballistic missile. 2 months later, on October 4, 1957, the R-7 missile was used to launch “Sputnik” (fellow traveler), the world’s first artificial satellite, into the Earth’s orbit. The successful launch of sputnik came as a surprise to the United States. It scared the US that the same technology can be used to launch a nuclear warhead at any city. The launch of sputnik-2 was planned swiftly after Premier Nikita Khrushchev wanted the launch to coincide with the 40th anniversary of the Bolshevik revolution. On 3rd November 1957, the USSR launched Sputnik-2 or Prosteyshiy Sputnik 2 with a living animal, a soviet space dog named Laika. However, Laika died after a few hours in orbit due to high temperature (Encyclopedia Britannica, 2020).

Not wanting to fall behind the USSR, President Eisenhower of the US ordered the Navy to accelerate the program and launch a satellite as soon as possible. There were 2 separate programs for the satellite launch. A civilian program by National academy of science in collaboration with Naval research laboratory and a second program led by US Army Ballistic Missile Agency in collaboration with Jet propulsion laboratory (Howell, 2020). On December 6, 1957, the Vanguard test vehicle (TV3) rose 4 feet into the air and crashed into the ground a second later. The Vanguard failure was a huge embarrassment to the United States after the Soviet Union successfully launched 2 satellites. The media and newspapers called the failed attempt “flopnik” and “kaputnik” in reference to the Soviet satellite sputnik (Garcia, 2017). Even a soviet representative to the United Nations mockingly suggested to the US delegate that Soviet Union had a program offering technical assistance to developing nations. The failure of the vanguard launch and multiple agencies with scarce resources developing space capabilities led to the launch of a single federal civilian space agency called the National Aeronautics and Space Administration (NASA) dedicated for space exploration, in 1958 (History.com, 2020).

On January 31, 1958, the United States launched its first satellite Explorer-1 designed by the US army and jet propulsion laboratory under the direction of rocket scientist Wernher von Braun. Explorer-1 transmitted data on micrometeorites and cosmic radiation for 105 days. President Eisenhower also signed the creation of two other national security-oriented space programs that would operate concurrently with NASA (Howell, 2020).



The Soviet Union launched a series of 24 unmanned spacecrafts to the moon. Luna 2 launched on September 12, 1959 was the first manmade object to reach the surface of the moon. Luna 2 flew for 36 hours straight and crash landed on the moon. Luna 2 was a success to the Soviets in a series of lunar missions. Soviet Premier Nikita Khrushchev on his only visit to the United States presented President Eisenhower with the replica of the soviet pennant that landed on the moon through Luna 2 (Encyclopedia Britannica, 2019).

The Soviet Union launched the Sputnik 5 on August 19, 1960 with 40 mice, a rabbit, 2 rats, plants and a pair of dogs (Strelka and Belka) into space. They are the first living species that went to orbit and returned to Earth safely. This mission boosted the confidence of the USSR to later send a man to space (Turner, 2014).

The spacecraft Vostok 1 was launched into space on April 12, 1961, with Soviet cosmonaut Yuri Alekseyevich Gagarin who became the first human being to travel into space. The 27-year-old test pilot and industrial technician also became the first man to orbit the planet in his space capsule in 89 minutes. Yuri Gagarin became a global celebrity and a national hero in the Soviet Union. The USSR had beaten the US again by successfully putting a man in space. It took 3 more months for America to put the first American in space. Project Mercury was an American effort to send a man into space (Turner, 2014). On May 5, 1961 Alan Shepard became the first American in space in his Mercury capsule Freedom 7. The mission was a success which 3 months later prompted President John Kennedy to give his famous speech about moon landing (Mars, 2021). On May 25, 1961, President Kennedy addressed the Joint session of congress delivering his electrifying speech about the ambitious goal of sending an American to the moon safely before the end of the decade. During a speech in Rice university on September 12, 1962 where he famously said “We choose to go to the moon. We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win, and the others, too” (Wall, 2012).

The USSR surpassed the US again by sending the first woman into space. Soviet cosmonaut Valentina Tereshkova became the first woman in space on 16 June, 1963 launched on a solo mission in spacecraft Vostok 6. She spent more than 70 hours orbiting the earth. Valentina was not just the first woman but also the first civilian in space. Soon after Valentina’s mission, the female cosmonaut program was discontinued (Royal Museums Greenwich, 2021).

On October 12, 1964, a crew of three Soviet cosmonauts-Vladimir Komarov, Boris Yegorov and Konstantin Feoktistov-completed 16 orbits in space aboard Voskhod 1. The Soviet spacecraft Voskhod-2 launched from its base in Baikonur on March 18, 1965, with cosmonauts Alexei Leonov and Pavel Belyayev whose mission was to accomplish humankind's first spacewalk. Alexei Leonev became the first man to do a spacewalk and it lasted for 12 minutes. There were a lot of complications during the mission but it was a success. On June 3, 1965, 2 months later, Ed white became the second man to walk in space and completed the first American spacewalk in Gemini-4 (Siegel, 2019).

Both the US and the USSR worked to put a man on the moon before each other. But the US had an advantage over the soviets this time. Wernher Von Braun's Saturn 5 rockets had no failure during testing. Also, the NASA budget increased up to 500% between 1961 to 1964. The NASA lunar landing program involved about 34,000 NASA employees and 375,000 employees of industrial and university contractors. The Soviet Space program suffered a massive setback after the death of Soviet lead space engineer Sergei Pavlovich Korolev.



Sergei Korolev died on 14 January 1966 while undergoing colon surgery for Cancer. Just days after Korolev's death, Luna 9 landed on the Moon. This was the last big Soviet first in space for a long time (European Space Agency, 2007).

On March 16, 1966, America successfully docked 2 spacecrafts in space. Gemini 8 piloted by Neil Armstrong successfully docked with unmanned Agena Target. This test gave the US the advantage to land a man on the moon. But the US suffered a setback. Astronauts Virgil Grissom, Ed White, and Roger Chaffee were killed in a fire during a launchpad test on January 27, 1967. The marching Apollo program was halted for a year after the tragic accident (William, 2018). Colonel Vladimir Komarov launched aboard Soyuz 1, on April 23, 1967, the first flight of the Soyuz spacecraft. Komarov died when the spacecraft crashed during its return to Earth. This was the first in-flight fatality in the history of human spaceflight (History.com, 2020).

Apollo 11 was a massive leap for man in space exploration. July 16, 1969, Apollo 11 astronauts Neil Armstrong, Edwin Buzz Aldrin and Michael Collins took off from Kennedy Space Center with the world watching. The mission was piloted by Neil Armstrong. Neil Armstrong became the first person to walk on the moon. As he took his first step, Armstrong famously said, "That's one small step for man, one giant leap for mankind." The Apollo program was an expensive and labor-intensive effort, involving about 400,000 engineers, technicians and scientists, and costing a lump sum of \$24 billion (Howell, 2020).

Space Ambitions of US, China and Russia

Chinese Space Ambitions

Space achievements are an integral part of Xi Jinping's Chinese Dream of broadcasting China's power and influence. In 2013, Chinese President Xi Jinping directed China to pursue a "space dream" to revolutionize China into a world-leading space power by 2045. China's first moment in space exploration started in 1964 by launching a biological satellite with live mice and recovering it successfully. After that China has had a lot of successful space endeavors. China has its own space station Tiangong in the earth's lower orbit. Chinese navigation network satellite Baidu is more accurate than the US-owned GPS. Chinese missions are challenging the US domination in space and technology. Chinese president Xi Jinping said "Space is an important strategic asset for the country that must be well managed and utilized and, more importantly, protected." China's space ambition includes a well-planned long-term strategy. These include cost effective launches, a space station, a lunar presence, space-based solar power, in-space manufacturing, deep space exploration and resource extraction from asteroids. For military space, China has showcased its Anti-satellite capabilities and un-hackable quantum-based satellites. China is looking to increase its presence in outer space and it emerges as a direct threat to US space domination (Thompson, 2020).

China's Major space milestones are: (Gao and Woo, 2020)

1. July 19, 1964- China launched and successfully recovered a biological rocket.
2. April 24, 1970- Dong Fang Hong 1, first Chinese artificial satellite was launched from Jiuquan launch centre.
3. November 20, 1999- China launched its unmanned spacecraft Shenzhou 1
4. October 15, 2003- Chinese Astronaut Yang Lewei spent about 21 hours in space aboard Shenzhou 5 spacecraft.
5. November 5, 2007- Chang'e 1, China's lunar orbiter successfully entered the moon's orbit.
6. September 29, 2011- Tiangong-1 (Heavenly palace), China's first space station was launched.
7. September 15, 2016- China's Tiangong-2 was launched as a part of a plan to have a permanent space station.
8. January 3, 2019- China launched Chang'e- 4 which landed on the far-side of the moon.



9. June 23, 2020- China successfully launched the final Bideu completing the navigation network that rivals the GPS (Global Positioning System).
10. November 24, 2020- Chang'e- 5 launched to collect moon samples to study the origin of the moon.

The USA space ambitions: (NASA, 2021)

The US is a dominant player in space exploration. With the massive involvement of the private sector in space, the US space ambitions are extensive. NASA aspires to be a global leader in scientific discovery of space. Some of their future projects (NASA and others) include:

1. Artemis program - Landing Astronauts in the Southern pole of the Moon by 2024
2. Aviation and supersonic technology
3. The Bigelow Expandable Activity Module (BEAM)- Inflatable habitats for astronauts in space.
4. Parker Solar probe- The solar probe aims to travel directly into the sun's atmosphere.
5. James Webb Space telescope (launched successfully on 25th Dec, 2021)
6. Europa Clipper- To probe Jupiter's moon Europa.
7. Manned mission to Mars, and several other missions.

The US is looking to maintain its dominant position in space. They look at space in terms of national security and look to counter Chinese advancements in space.

Russian Space Ambitions

Once a space superpower, the Russian space program now is looking at corruption and budget constraints. Russia is largely collaborating with China on various space missions including the Lunar space station. Russia and China have some ambitious space plans that rival the US. The US sanctions are pushing Russia towards China in space cooperation. Some of Russia's future missions are:

1. Own space station in 2025- As the agreement for ISS ends in 2024, Russia is looking to launch its own space station (The BBC, 2021).
2. Robotic mission to asteroid Kamo'oalewa in 2024 (Kramer and Myers, 2021).
3. Lunar space station (Kramer and Myers, 2021).
4. Venera-D Venus lander (Schulze-Makuch, 2019).
5. Expansion of the Vostochny Cosmodrome (Bodner, 2019).

With rising tensions between Russia and the US along with other European countries, Russia looks to re-establish its lost glory in space with Chinese resources.

Space Race in the Post-Cold War Period

Improving relations between the US and USSR negotiated by Soviet Premier Leonid Brezhnev and US president Richard Nixon, both countries moved towards cooperation. A symbol of this cooperation is the joint Apollo-Soyuz mission. The US Apollo spacecraft with astronauts Thomas P. Stafford, Vance D. Brand, Deke Slayton docked with Soviet Soyuz spacecraft with astronauts Alexei Leonov, Valeri Kubasov on July 17, 1975. NASA astronauts and Soviet cosmonauts performed a series of scientific experiments and technology demonstrations. But the mission's main purpose was far earthlier. It was a political demonstration of peace. The Apollo-Soyuz mission marked the formal end of the space race and the beginning of an extended era of international cooperation in space (Betz, 2020).

This cooperation between the US and the USSR led to the formation of the ISS. The International Space Station (ISS) is a modular space station in earth orbit. It was a multinational space project with the US(NASA) and Russia (ROSCOSMOS) at the helm with Japan (JAXA), Europe (ESA) and Canada (CSA).



The US and Russia were trying to build their own space stations but in 1993 both countries agreed to merge their separate stations into a single facility with contributions from JAXA and ESA. On November 2, 1993, the ISS received its first crew of 2 Russian cosmonauts Sergey Krikalev and Yuri Gidzenko, and American astronaut William Shepherd who flew to the facility in Russian Soyuz (Harland, 2021 and Howell, 2021).

The cooperation between the US and now Russia didn't last long. The New space race is far different from the space race during the cold war between Russia and the US. There are new players in the field of Space exploration. The geopolitical dynamics are very different between countries than what it was before. The cold war era space war was between ideologies but today it is more about economic, scientific, military and political opportunities. Countries take pride and prestige in achieving space milestones. Lots of countries cooperate on various space missions and projects. The New space race is between the US, Russia and China. Lot of the other space players are US allies or friends.

The US sanctions have affected Russia's ability to invest huge resources into space and challenge American supremacy. Russia is teaming up with China on a lot of space missions and programs to counter American domination in space. After years of limited cooperation, Russia has ambitious space plans with China that would directly compete with the US ushering into an era of new space race. Russia has also informed that they may pull out of the international space station after the agreement ends in 2024. The main reason behind the move is speculated as the harming sanctions and policies of the US government that impacts the Russian space program. Russia is also battling corruption and a stagnant economy unable to invest the huge resources required for space endeavors. Working with China in space missions gives Russia the possibility to continue its space journey. The cooperation between Russia and China is mainly because of the close relationship between Vladimir Putin and Xi Jinping. Russia has the operational space knowledge combined with Chinese technology and resources can be a highly significant cooperation (Kramer and Myers, 2021).

One of the most important Russia-China collaborations is on the Lunar space station. ROSCOSMOS has signed an agreement with CNSA to develop research facilities on the moon. A statement from both agencies read "China and Russia will use their accumulated experience in space science, research and development and use of space equipment and space technology to jointly develop a road map for the construction of an international lunar scientific research station" (The BBC,2020). China understands that a strong space program is key to strong defense. China wants to end the US dominance and put more satellites into space than the US.

The national security law of the People's Republic of china-2015, talks about space-based factors in determining national security. The message is future conflicts may cross beyond the traditional land, air, and sea-based dimensions. The ability to gather, convey, analyze, and resort to information faster than an adversary has been recognized as the tool of space-information dominance, representing a significant point of strategic competition. China successfully blinded an US satellite in 2006, an Anti-satellite test in 2007 and testing of exo-atmospheric vehicle in 2015 indicate the country's inclination to oppose external threats and dissuade adversaries in the space. The head of the Chinese Lunar Exploration Program, Ye Peijian, divulged the imperial ambitions of China's activities in space. He said "The universe is an ocean, the moon is the Diaoyu Island, Mars is the Huangyan Island. If we don't go when we can go now, then future generations will blame us. If others go, then they will take over, and you won't be able to go even if you wanted to. This is reason enough" (Thompson, 2021).

Gen. James Dickinson, the head of U.S. Space Command said that "The space domain is competitive, congested, and contested. Our competitors, most notably China and Russia, have militarized this domain."



The US needs a steady space policy and technological innovations to counter growing Chinese influence (Aerotech News, 2021). The US can also utilize the rise of friendly space agencies like JAXA, ISRO, ISA and ESA to establish a balance of power in space. The US needs to step up, not to dominate space but to prevent the hegemony of China in space.

Conclusion

A little competition between countries can fuel innovation. The cold-war era space race led to the creation of technological innovations like Smartphones, Laptops, Smoke detectors, Artificial limbs, Memory foam, water purification, wireless headphones, freeze dried food and many more. With the entry of new space players like JAXA (Japan), ISRO (India), ISA (Israel) and other agencies, further heights can be reached in space innovation by cooperation between agencies. But the kind of race that is happening now with countries trying to weaponize and militarize space doesn't bode well for Humanity. The resources and innovations the space could offer are endless but it is in the hands of countries to utilize the resources and not use space as another war field (Barnes-Brown, 2019).

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