Exploring and Evaluating the Need of a Space Warfare Operations Readiness Division (SWORD) for an Emerging Space Superpower like India

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The emergence of space as a domain for military weaponisation operations highlights the need for specialised organisations such as Space Warfare Operations Readiness Division (SWORD) to monitor and defend space-based assets, develop and deploy space-based weapons systems and conduct retaliatory space operations, if necessary. As an emerging space superpower, India has been able to make significant strides in space technology and exploration. Also, it has recognised the importance of space for national security, economic development and scientific research. India's Mission Shakti operation and the tri-service space agency Defence Space Agency are examples of its efforts to develop capabilities for space security and protect its space assets. The need for cybersecurity infrastructure and building resilience and redundancy in space-based infrastructure are also highlighted. The development of space capabilities must be balanced against the potential risks and limitations of weaponising space and it should be undertaken with close collaboration and adherence to international laws and norms.

Keywords: *Weaponisation of space, Space warfare, National security, Unmanned Autonomous Systems*

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Introduction

The objective of this article is to analyse India's space security infrastructure and explore the need for Space Warfare Operations Readiness Division (SWORD) through the lenses of economics, law[1] and international relations. The article aims to bridge the research gap on the need for establishing a space defence force in India. As the Indian Space Policy and related legal literature are in the nascent stages of evolution, the article analyses the critical issues surrounding the creation of an iron dome of Space Security Legislation.[2]

The research hypothesis is that India requires a dedicated organisation such as SWORD to address space security concerns. The article seeks to address three primary research questions. First, what is the current space security scenario globally? Second, does India require a space force to maintain peace, security and harmony in the Indian sub-continent? Finally, how should India deal with scenarios of space technology denials and sanctions by other countries?

The article examines crucial topics such as the importance of maintaining a secure space environment in the current era and the contribution of global institutions in upholding space security. The article also examines whether SWORD is just science fiction in 2023 and whether space dominance is necessary to display soft power. In addition, the article assesses whether SWORD should be incorporated into India's Space Security Policy and whether the current space defence systems are sufficient to maintain space security.

The research findings will contribute to the literature on space security and offer recommendations on how India can enhance its space security infrastructure.

Concept of Security and Space Warfare for Protecting Space-based Assets

The United Nations (UN) has formulated several resolutions relating to space law, including the 1959 Resolution 132, which established a committee on peace, and the 1962 Resolution (XVIII), which established two major legal principles applicable to outer space. The Outer Space Treaty of 1967 provides for freedom of exploration, peace, international cooperation, scientific investigation, international consultation, liability of States, non-appropriation, mutual assistance of states, arms control measures and environment protection of outer space. The Moon Agreement of 1979

categorically states that scientific exploration of the Moon should be done for peaceful purposes alone, and the Moon and other celestial bodies and their natural resources are to be regarded as the common heritage of mankind, explicitly prohibiting militarisation and weaponisation.

Space security laws in India are in their nascent stage, and the need for them is more than ever as India is swiftly moving towards self-sufficiency with its cost-effective space programmes, attracting the attention of other nations. Space is a vital resource for India's communication, commerce, navigation and intelligence sectors. Though there are UN treaties, principles and UN General Assembly resolutions on specific topics of outer space activities, the States parties do not strictly adhere to these norms and regulations. Therefore, India needs to build its own capabilities to protect itself and deter any potential adversaries in case a conflict escalates to the space domain.

Space Security

With the rise of space-based assets, such as communication, Earth observation and navigation satellites, the concept of space warfare[3] has become a pressing issue. To ensure the safety and uninterrupted operations of these assets, security measures must be put in place. Encryption is a crucial aspect of space security as it protects against unauthorised access to transmitted data. Authentication protocols, such as digital signatures, are also necessary to verify the authenticity of commands and control messages. Physical hardening techniques, such as shielding and manoeuvring capabilities, can protect against kinetic attacks from anti-satellite weapons or debris. Additionally, redundancy measures such as backup systems or multiple satellites, can ensure uninterrupted operations in the event of an attack or failure. Continuously updating and maintaining the effectiveness of these security measures is necessary to stay ahead of potential threats. By implementing a multi-faceted approach to space security, countries can ensure the safety of their space-based assets.

Space Warfare

Space warfare has gained significant attention in this era due to the increasing reliance of modern military operations on space-based assets. While these assets provide significant advantages, they also have vulnerabilities that give rise to potential threats, making it necessary to consider the warfare aspect of space security to protect these assets.

One of the primary threats to space-based assets is anti-satellite weapons (ASATs), which are designed to destroy or disable satellites in

orbit. Countries are developing strategies to defend against them, such as developing countermeasures that can evade or disable incoming attacks and hardening techniques that can withstand or mitigate the effects of an attack. Additionally, cyber warfare is another threat to space-based assets, which makes cyber security measures essential to protect them from cyber attacks.

Regularly applying software patches and updates to fix vulnerabilities or weaknesses that may be exploited by attackers is also essential. Moreover, the deployment of space-based assets for aggressive purposes must be cautiously evaluated to maintain global balance and avoid further intensification of space-based conflicts.

Protection of Space-based Assets

Space-based assets are crucial components of modern military operations. Satellites provide capabilities such as communication, navigation and reconnaissance, among others. However, these assets are vulnerable to a wide range of threats, including anti-satellite weapons, cyber attacks and debris. Therefore, protecting space-based assets is a critical consideration for ensuring the safety and uninterrupted operations of military forces.

One approach to protecting space-based assets is through the use of hardening techniques. Hardening involves the use of materials or techniques that can withstand the effects of an attack or minimise its impact. Satellites can be equipped with shielding materials that can protect them from the effects of kinetic attacks or electromagnetic pulses (EMPs). Additionally, satellite operators can use redundancy measures such as backup systems or multiple satellites, to ensure that operations continue in the event of an attack or failure.

Another approach is through the use of encryption and authentication protocols. Encryption involves the use of algorithms to scramble data so that it can only be accessed by authorised users. Authentication protocols such as digital signatures, verify that commands or data originated from a trusted source. By implementing strong encryption and authentication protocols, space-based assets can be protected from unauthorised access and manipulation.

Furthermore, the use of countermeasures can also be effective in protecting space-based assets. Countermeasures involve the use of techniques or technologies to evade or disable incoming attacks. Satellites can be equipped with manoeuvring capabilities that allow them to change orbit or direction to evade incoming threats. Additionally, satellite operators can use jamming

techniques to interfere with the guidance systems of incoming missiles or launch decoy satellites to confuse attackers.

Cybersecurity[4] is another critical consideration for protecting space-based assets. Many of these assets rely on software systems that can be vulnerable to cyber attacks. Hackers can gain access to satellite systems and disrupt or manipulate their operations, potentially causing serious damage. Therefore, strong cybersecurity measures must be implemented to protect space-based assets from cyber attacks.

Furthermore, the use of intrusion detection systems and firewalls can help prevent unauthorised access to satellite systems.

International cooperation is also essential for protecting space-based assets. Space-based assets are critical for the operations of many countries and attacks on these assets can have severe consequences for global stability. Therefore, countries must work together to develop common standards and best practices for protecting space-based assets. Additionally, diplomatic efforts must be made to prevent the escalation of space-based conflict.

However, protecting space-based assets also raises ethical and legal considerations. The use of anti-satellite weapons and other offensive capabilities in space raises concerns about the militarisation and weaponisation of space. The Outer Space Treaty of 1967 prohibits the placement of nuclear weapons and other weapons of mass destruction in space, but there are currently no specific provisions prohibiting the use of anti-satellite weapons. Therefore, countries must carefully consider the ethical and legal implications of their actions in space and work together to develop common standards and best practices for the responsible use of space-based assets.

Utilisation and Militarisation of Space to Ensure Terrestrial and Cyber Superiority

The utilisation of space assets has become essential for modern society with the commercial sector investing significantly in space-based applications for economic growth and development. The scientific community has also benefitted significantly from space exploration and research, leading to discoveries and technological advancements. However, the increasing dependence on space assets has made them vulnerable to disruption and destruction, raising concerns about the security and stability of space assets. The weaponisation and militarisation of space have become a significant concern, with countries utilising military satellites and testing space-based weapons. The deployment of space-based weapons could potentially trigger

a space arms race, leading to increased tensions and instability, potentially impacting global security. The destruction of space assets could disrupt vital services, leading to significant economic and societal impacts.

Militarisation of Space

Space technology has become an essential aspect of modern warfare, providing countries with strategic advantages in terrestrial and cyber wars. The deployment of military satellites has enabled advanced communication, navigation and surveillance capabilities, providing real-time data and intelligence for military operations. The lack of international rules has increased the danger of space weaponisation and the possibility of a space arms race. The 1967 Outer Space Treaty is the main international treaty that regulates space activities. It bans the installation of weapons of mass destruction in space and requires countries to use space for peaceful purposes. However, it does not explicitly ban the installation of conventional weapons in space or the use of military satellites for intelligence gathering or communication.

The lack of consensus among countries on the issue has made it challenging to establish an international treaty to regulate the militarisation of space. Efforts to establish international regulations have been ongoing, with various proposals and initiatives from different countries and organisations. For example, the European Union proposed the International Code of Conduct for Outer Space Activities in 2008, which outlines guidelines for responsible conduct in space activities, but this did not progress after 2015 Open Ended discussions. Similarly, the United Nations General Assembly (UNGA) sponsored an initiative on Transparency and Confidence Building Measures (TCBMs) in outer space activities in 2013.

In cyber wars, space technology has also become a critical component, providing countries with advanced cyber capabilities. The deployment of satellites for communication has enabled the development of advanced communication networks, including secure communication channels for military operations. Additionally, space technology has enabled the deployment of advanced surveillance capabilities for monitoring cyber threats, enabling proactive measures to be taken to prevent cyberattacks. The deployment of cyber weapons has become an essential aspect of modern warfare, enabling countries to disrupt enemy communication and information networks, leading to strategic advantages on the battlefield.

The utilisation, weaponisation and militarisation of space have become critical aspects of modern warfare, providing countries with

strategic advantages in terrestrial and cyber wars. However, the increasing dependence on space technology and the potential escalation of a space arms race have raised significant concerns about the security and stability of space assets. Therefore, it is essential to prioritise international cooperation and establish international regulations governing the deployment of space-based weapons and the militarisation of space to maintain global security and stability.

CONCEPT AND EVOLUTION OF INTERNATIONAL SPACE SECURITY ORGANISATIONS

International organisations are entities that are created by states, individuals or other entities to promote cooperation and coordination on matters of international significance. They have been established in various fields, including trade, finance, development, health, environment and security. The concept of international organisations dates back to the establishment of the International Telegraph Union in 1865, and today there are hundreds of international organisations, ranging from small specialised agencies to large global organisations such as the UN.

International security organisations have been established to address threats to global security, including war, terrorism, weapons proliferation and cyber threats. The League of Nations was established in 1920 to prevent another world war, but it failed to do so, leading to the establishment of the UN in 1945. The UN is the most significant international security organisation, with 193 member states. It has several bodies dedicated to maintaining international peace and security, including the Security Council and the International Court of Justice. Several regional security organisations have also been established, such as North Atlantic Treaty Organization (NATO), the African Union, the Organization of American States and Association of Southeast Asian Nations (ASEAN).

International space organisations have been established to promote cooperation and coordination in space exploration and utilisation. The earliest international space organisation is Committee on Space Research (COSPAR), established in 1958, to promote international cooperation in space research. Several other international space organisations have been established, including the United Nations Office for Outer Space Affairs (UNOOSA), the European Space Agency and the International Space Station.

International space security organisations have become increasingly important in recent years due to the growing recognition of the need to ensure the safety and security of space activities. The Committee on the Peaceful Uses of Outer Space (COPUOS) is the primary international space security organisation, established in 1959 to promote international cooperation in the peaceful uses of outer space and to encourage the development of space science and technology. Other international space security organisations include the Space Security Index and the Space Generation Advisory Council. Countries such as the United States (US), China and Russia have also established national space security organisations to address the security challenges associated with space activities. The primary focus of international space security organisations is on preventing the militarisation of space and promoting the peaceful uses of outer space.

India's Achievements in Space Security

India has made significant progress in space security in recent years, with a number of achievements that have cemented the country's position as a space power. Some of the key achievements in this area, including Mission Shakti, the development of the Navigation with Indian Constellation (NAVIC), secure satellite-assisted communications, satellite-based Intelligence, Surveillance-Reconnaissance (ISR) and the work of the Defence Space Agency (DSA) have been discussed in this article.

Perhaps the most notable of these achievements is Mission Shakti, which was launched by the Defence Research & Development Organisation (DRDO) in March 2019. This mission involved the successful test of an anti-satellite (ASAT) missile, which demonstrated India's capability to protect its space assets in outer space. This was a significant milestone for India's space security programme as it demonstrated the country's ability to defend itself against potential threats from other nations.

Another key achievement in India's space security programme is the development of NAVIC, a satellite-based navigation system that provides accurate and reliable positioning information to users in India and beyond. NAVIC is India's equivalent of the GPS system developed by the US and it has a number of advantages over GPS, including better accuracy in urban environments and improved reliability during times of crisis or conflict.

In addition to these achievements, India has also made progress in the development of secure satellite-assisted communications, which allow

the military and other security agencies to communicate securely using satellite-based technology. This is particularly important in a country like India, which has a large and diverse population and a complex security environment.

Another key area of progress in India's space security programme is the development of satellite-based ISR capabilities, which allow the military and other security agencies to gather intelligence, surveillance and reconnaissance information using satellites. This technology has several advantages over traditional methods of ISR, including the ability to gather information from areas that are difficult or impossible to access by other means.

Finally, the DSA is playing an important role in the development of India's space security capabilities. This agency, which was established in 2018, is responsible for developing new technologies and strategies to enhance India's space security programme. Some of the key areas of focus for the DSA include the development of space-based weapons systems, the enhancement of satellite-based communications and the development of advanced ISR capabilities.

Space Situational Awareness (SSA) involves monitoring and predicting the movement of objects in Earth's orbit. India has been actively enhancing its SSA capabilities. The SSA Control Centre, established by the Indian Space Research Organisation (ISRO), monitors low Earth orbit (LEO) satellites and remote sensing aircraft. India has also signed an SSA agreement with the US and is setting up its first commercial SSA observatory. SSA plays a crucial role in ensuring safe and sustainable space use, and India is committed to advancing its capabilities in this domain.

As India continues to invest in its space security programme, it is likely that further advances in this area will be seen in the years to come.

Importance of SWORD for India

The increasing reliance on space-based infrastructure highlights the need for a dedicated organisation to safeguard against threats and ensure readiness for any eventuality. SWORD is proposed to operate similarly to the US Space Force, with a mandate to ensure readiness to tackle space and cyber attacks, offensive readiness capabilities and the power to manage and clear space debris. SWORD's establishment would bring several benefits, including safeguarding national interests, deterring hostile activities in space, promoting peace and stability and reducing the risk of accidents and collisions. The

Division would also contribute to the development and deployment of new space technologies and drive innovation in the space sector.

The establishment of SWORD would have significant implications from the lenses of security, economics, foreign policy and space law.

From a security perspective, the establishment of SWORD would enhance India's ability to protect its space-based infrastructure and assets. The Division's mandate to ensure readiness to tackle space and cyber attacks and to have offensive readiness capabilities would enable the US to deter and respond to any potential threats. This would contribute to the overall security of the US and its allies, particularly as space-based infrastructure plays a critical role in military and intelligence operations.

From an economic perspective, the establishment of SWORD would have implications for the space industry. The power to manage and clear space debris would reduce the risk of collisions and accidents, thereby increasing the safety of space operations. This would, in turn, reduce the cost of space operations and potentially lower insurance costs for space-related activities. Additionally, SWORD's offensive readiness capabilities would drive innovation in the space industry, leading to the development of new technologies and products that could have economic benefits.

From a foreign policy perspective, the establishment of SWORD would have implications for India's relationship with other countries. The deployment of offensive weapons in space could be perceived as a threat by other countries, particularly those with space capabilities. However, the power to manage and clear space debris could be seen as a positive contribution to the international community, particularly as space debris poses a threat to the safety of all space operations.

From a space law perspective, the establishment of SWORD would raise questions about the weaponization of space. Additionally, the power to manage and clear space debris could raise questions about liability for space debris and the legal responsibility of spacefaring nations to manage and mitigate the impact of space debris.

The establishment of SWORD would have significant implications in India's security, economics, foreign policy and space law.[5] While the Division's mandate to ensure readiness to tackle space and cyber attacks and manage space debris could contribute to the overall security and safety of space operations. It is important for India to consider these implications carefully and to engage in open and transparent discussions with other spacefaring nations about the establishment of SWORD and its mandate.

Dealing Economically with International Sanctions in Space Technology Domain

India has emerged as a major player in the global economy, but faces challenges in technology sanctions, particularly with the US. Sanctions have been imposed in defence and nuclear technology. Despite these challenges, India's demographic dividend positions the country for continued growth. Soft power assets, such as cultural diversity and entrepreneurship, can strengthen India's position in the global economy. India should develop indigenous technology capabilities and explore alternative sources of technology to reduce reliance on imports. Building stronger partnerships with other countries in Asia and Africa can also help address the challenges of technology sanctions. By leveraging its soft power and continuing to develop its technology capabilities, India can overcome these challenges and continue to thrive in the global economy.

Conclusion

In conclusion, the emergence of space as a domain for military operations and the increasing importance of space-based assets for national security, economic development and scientific research highlight the need for specialised organisations such as SWORD to monitor and defend space-based assets, develop and deploy space-based weapons systems and conduct retaliatory space operations, if necessary. As an emerging space superpower, India has recognised the importance of space for its national security and has made significant strides in space technology and exploration. However, the development of space capabilities must be balanced against the potential risks and limitations of weaponising the outer space and undertaken with close collaboration and adherence to international laws and norms.

Finally, the article offers recommendations on how India can enhance its space security infrastructure, such as developing a legal framework for space security, enhancing its cybersecurity infrastructure, building resilience and redundancy in space-based infrastructure and addressing scenarios of space technology denials and sanctions. By implementing these recommendations and continuing to invest in space technology and exploration, India can emerge as a leader in space security and ensure its long-term national security, economic development and scientific advancement.[6]

NOTES

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