

Terrorism in Space: A Possibility

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Abstract

Rapid development in the space tech industry and the proliferation of non-state actors present a wide array of opportunities and challenges, the most significant challenge being the possibility of space terrorism. Although no act of space related terrorism has been recorded yet it is a possibility which cannot be ignored. It requires attention of policymakers at both state and international levels. Lack of discourse analysis and absence of a definitional aspect on the subject makes the threat cataclysmic. This highlights various challenges in space security studies and presents a view point of various motives and capabilities of terrorist organizations in space. It discusses potential targets of space attacks and dilates on the importance of collaborative efforts in tackling the threat, including international organizations` role. Lastly, the paper explores some strategies that may assist policymakers in devising tenable counter-terrorism policy for space.

Keywords

Space terrorism, Space technology, Space security, Space industry, Satellites, Counterterrorism, Terrorism, Policymakers

Introduction

The possibility of terrorism in space is becoming increasingly possible if not yet probable as the world is becoming heavily

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dependent on space for military and civilian purposes. It should be a source of concern for the major powers and small states alike. An attack on space stations and satellites can have catastrophic consequences for the states, and lead to mass casualties, and damage to infrastructure. The terrorists can exploit loopholes in the existing definitions and policies with regard to space terrorism to achieve their objectives.

In this paper, we will examine the potential of perpetrating terrorism in space, the emergence of this new category of terrorism, and formulate a definition of space terrorism. Since counter-terrorism experts and policymakers largely neglect this field; we will identify the new non-state actors, their motives, threats, and capabilities in the contemporary era. Moreover, the loopholes in the definition of space security and international space law, and the need to introduce a counter-terrorism policy related to space is explained. This paper will suggest policy recommendations by looking into the problem from three angles and also possible solutions. A Political Solution, a Military Solution-War model, and the Criminal Justice model. The paper also includes a theoretical framework in order to discuss the phenomenon of terrorism in space.

Theoretical framework

Neo-functionalism has made a significant contribution in helping us understand the role of non-state actors in the international arena. It gives an in-depth analysis of how these actors can influence the policies of democratic states. The theory highlights the rise of integration and interdependence between states, which, in turn, resulted in the escalation of shared common interests. In addition, it talks about the need for developing an institutional mechanism for resolving future conflicts. These concepts can be applied to the ideas presented in the paper, suggesting that the role of terrorist

organizations against space assets requires close and serious attention. The shared interest in this case being countering terrorism which can aid us in developing a suitable institutional mechanism to forestall the possible operations of terrorist groups. The theory will further help analyze the mutual benefits gained by states from devising an apparatus to counter the threat of space terrorism.

The Rational Choice theory is another theory employed in this paper to help devise policy recommendation to counter terrorism in space. A rational choice model suggests that if we assume that terrorists behave rationally, knowledge of their preferences and beliefs can help us understand and predict their behaviour. In other words, the more predictable and rational terrorists behaviour is, the easier it would be to determine their motives and deal with them. In addition, the theory suggests that terrorist activities can be minimized if we increase the overall cost of taking part in such activities. When such acts result in a negative-sum game, terrorists are likely to alter their behaviour.

Understanding Space Security

The definition of security is a highly contested term, and its interpretation varies as per the national interests of the respective countries. In general, 'space security' is defined as the ability to place and operate the assets outside the Earth's atmosphere without external interference, damage, or destruction.¹ Another definition used by Canada defines space security as "the secure and sustainable use and access of space." The Space Generation Council elaborates the definition and states "secure and sustainable use and access of outer space with adherence to the international laws, treaties, and free from threat of disruption."²

However, these definitions fail to fully encompass the role of satellites in contributing to the security of states, the threats faced

by the space industry from non-state actors, and contribution of assets on earth such as ground stations to the security of the states. It means that to attain security in space, we need to overcome man-made and natural threats, given the extreme hostility of the space environment and threats from non-state actors.

Likewise, the Space law addresses a variety of matters, such as the preservation of space and Earth environment, liability for damages caused by space objects, the settlement of disputes, the rescue of astronauts, the sharing of information about potential dangers in outer space, the use of space-related technologies, and international cooperation. However, it also fails to address the terrorist threats from non-state actors in space and on Earth.

The Emerging Concept of Space Terrorism

The complex phenomenon of ‘terrorism’ has made the construction of a universally acceptable definition of the term complicated. To address this problem, various definitions exist that describe particular types of terrorist activities more narrowly. Moreover, there are different types of terrorism that one may use to differentiate between terrorist motivated activities. The most widely used categories are politically motivated terrorism that can be motivated by ideological goals in particular and are primarily associated with national liberation terrorist, right and left-wing terrorisms, and religious terrorism.

Another way of categorizing terrorism is with respect to their areas of operation. This is subdivided into state terrorism (acts of terrorism conducted by a state against its citizens or another state), international terrorism (conducted against more than one state, e.g. aviation terrorism), and separatist terrorism (motivated by religious, political or ethnic factors for independence). The most significant category is the typology of terrorism that is constructed upon place of occurrence of terrorism. In this category, we may

place aviation terrorism, cyber-terrorism, land terrorism, maritime terrorism, and finally, space terrorism.

Defining Terrorism in Space

The possibility of terrorism in space is an emerging concept, yet it has attracted attention of some experts and scholars like J.R Cain who described space terrorism as:-

“An act of violence by one or more individuals or groups to prevent the development of a space settlement(s) and/or their aims including those of a spaceship or space station during Man’s exploration of space”.³

However, this definition is extremely vague and does not include the destruction that can occur on Earth and may have nothing to do with the settlement but still be related to the space sector, such as ground space stations, rocket launch sites, and cyber-attacks on space system on ground etc. Also, this definition can be misleading as it regards all acts of violence or terror as terrorism regardless of the motivation. By following that analogy, every attack against the development of space settlement, such as theft, can be considered as terrorism. Another definition of Space terrorism is proposed by Paweł Bernat and Elżbieta Pośluszna, “A purposeful and well-thought-out act of destruction against human and/or material resources of space industry undertaken by individuals or groups out of ideological motivation, where space industry is understood as an economic sector dedicated to producing components that go into Earth's orbit or beyond, delivering them to those regions, and related services”.⁴

This definition too is narrow as it states the space industry only in the economic domain whereas space is beyond that. It encompasses cultural, social, national security and cyber aspects as well. To narrow it to economically motivated terrorism excludes terrorist activities targeting other domains.

Hence, we have proposed the definition of Space terrorism that covers all aspects.

“Space terrorism is an act of violence or terror that targets space industry whether in space (such as space station, satellites, etc.) Or on Earth (ground stations, rocket launcher sites, etc.) and particular individuals (astronauts) that will endanger human and material resources in space and Earth alike. These acts can be motivated by ideological factors that aim to target countries, and region as a whole since the world is increasingly becoming dependent on space technology”.

Potential Motives of Space Terrorism

To understand why terrorists may engage in terrorist activities we also need to understand the unique and special character of space such as its symbolic importance, money invested, and the worldwide media coverage associated with it. Thus, the act of space terrorism is more suited to achieving the aims of the terrorist groups. These groups might target advanced states such as the USA, Russia, or China with devastating effect. The reason being that these states are becoming more dependent on space technology with each passing day and a successful attack will result in large scale destruction to the infrastructure and human lives.

Counter-terrorism experts argue that even though suicide is often considered the primary weapon of the terrorists, it is never their first choice but used when other options have failed. This option is a means of achieving the desired result and is not a requirement of the catastrophic act. Therefore, the terrorists will opt for any method as long as it is available and help achieve mass casualties or a long-lasting psychological effect.

Terrorist groups select a target, which usually has a symbolic meaning or purpose. That means that there is an unlimited category of targets available to them to choose from. Even though

counter-terrorism experts claim that terrorist operations rarely show innovation in their tactical operations. The world is rapidly progressing and the availability of new materials and learning of new skills is becoming easier. Terrorists are therefore more likely to expand choice of their targets.

Hence the policymakers need to foresee new possible threats that might emerge with the change in time and put themselves in the shoes of the terrorist to predict new methods they may use in future. As the world is advancing with its defense plans, the terrorists will most likely search for new ways to inflict damage. A terrorist-launched cruise missile attack would be an attractive option for terrorists against the US, as it has significant dependency on satellites and space based assets.

Threat of Terrorism in space: Possibilities and Capabilities

The threat of terrorism in space was highlighted by the US Undersecretary of State, Robert Joseph, who warned the public at the George C. Marshall Institute about the potential terrorist attacks on US space assets in 2006.⁵ His view was in conformity with the US 2006 Space policy, which argues about the capabilities and possible role played by transnational actors in interfering with space assets. There are three widely identified categories of 'potential terrorist acts in space': measures against satellites, attacks on launch facilities and ground stations, and user/service equipment attacks. An attack against satellites or an attempt to hijack them can cripple any state in today's digital world since they relay on signals around the world and are used to operate our televisions, telephones, help in navigations through Global Positioning System (GPS), weather and climate prediction and monitoring systems, detecting underwater minerals, and for rapid and efficient communication.⁶

The ideal way to make affairs of a state on stand-hold would be through eliminating a satellite communication in its uses. However, that can be a difficult task. Other ways to achieve the same objective can be through disruption, denial, degradation, and deception of the space system. Different satellites have different purposes; military satellites are better shielded than a commercial satellite. Therefore a commercial satellite can be a suitable target for terrorists looking for new methods to achieve their objective of mass casualties and psychological effects. In advanced and developed states such as the US, traffic signals are controlled through cyber and satellite signals. A single disruption can cause accidents that can have a domino effect.

Eventually it was observed that the first step to attack a satellite is to track it. To do so it only requires minimal technology such as stopwatches, sky maps, personal computers, and binoculars to observe a satellite's orbital element. That's why the US Undersecretary of State Robert Joseph showed concern over non-governmental satellite observers tracking and posting satellite orbits on the internet, which the terrorist organizations can use for achieving their agendas.

The simplest way to disrupt the satellite is through electronic interference, i.e. jamming or spoofing the satellite's signals. Jamming means blocking or disturbing the communication signals travelling to and from the satellite by producing noise of the same radio frequency within the field of view of the satellite's antennas.⁷ In contrast, spoofing is to mimic the characteristics of accurate signal so that the users receive a fake signal.

Occurrences of hijacking and jamming are becoming increasingly common. In 2006, Thuraya Satellite Telecommunications of Abu Dhabi pinpointed that months-long intentional jamming of mobile satellite was detected to be originating from three different places in Libya. This major jamming event recorded in commercial

satellite sectors was executed by some Libyan nationals. They were smuggling Marlboro cigarettes from Chad or Niger into Libya and they were using Thuraya satellite phones⁸ to communicate with each other. They aimed to disrupt the communication signals to prevent the Libyan officials from overhearing their conversation. However, they jammed the signals on a large scale and ended up disrupting the signals beyond Libyan borders as well. As a result, Thuraya suffered huge losses as it tried to expand its network by launching a third satellite. If a gang of cigarette smugglers in Libya in 2006 can have the capability to jam the signals outside Libyan borders, it is alarming to imagine what terrorists can do now, 14 years later.⁹

Sri Lankan Tamil Tigers (LTTE) are declared terrorists by the US government.¹⁰ They hijacked Intelsat Ltd and used satellite transponder to broadcast their propaganda across the Indian subcontinent. Intelsat tried to shut down LTTE's pirating, but LTTE continued its satellite piracy for two years. Similarly in China, China's Falun Gong hijacked the broadcasting signals of nine China Central Television stations, and ten provincial stations and broadcasted their agenda of religious spiritualism in 2002. Later in 2004, they again disrupted AsiaSat signals for 4 hours.

Another way to attack satellites is by targeting their sensors with lasers. The laser beam can either interfere with or damage the satellite sensor. Also, it can melt fragile electronic connections as it induces thermo-mechanical stresses and structural damages. Moreover, satellites could be targeted as a whole through energy beams. However, it is a highly technical operation and requires several elements: reliable booster system with payload capacity, type of target that affects the delivery, up-to-date maintenance, and efficient crew, extensive space surveillance and tracking system, a medium to place the target in the range of the weapon, ability to kill the target, and ability to determine if the attack was successful

or not. This is dangerous as an attack targeting a satellite may lead to secondary damages in the space orbit and may also hit the astronauts.

The most deadly option against the satellites could be a nuclear explosion at an altitude of 250 km in LEO. It will generate an electromagnetic pulse and destroy all satellites in the line of sight of the explosion. Another effect would be that this pulse will halt the communication between ground stations and these satellites for months or years. The effectiveness of an EMP attack makes this method most favourable for terrorists, provided that they have nuclear capabilities. They can even target the ground stations on the Earth, industrial sites, and specific individuals to disrupt the satellite signals. Since most commercial space systems have one operation center and the ground station, leaves them vulnerable to such attacks. Nevertheless damage to a ground station can be repaired but a damaged satellite cannot be fixed.

If terrorists launch a series of coordinated attacks starting with the blinding of intelligence satellites and disabling them from detecting the destruction of a military communication satellite. That means that the military would not be able to monitor any battlefield. Furthermore an attack on launch facilities would make the replacement of the damaged satellite impossible. The blackout would create panic among the armed forces, and the objective of terrorists to inflict mass casualties and long-lasting psychological effects would have been achieved. Terrorist groups can develop a delivery system of their own by using an anti-ship cruise missile or an unmanned vehicle (UAV). An obstacle that space terrorists face is lack of advanced mechanical and engineering experience and positioning the delivery system at the right launch position. However, these problems can be overcome by inducting trained engineers and launching problems could be resolved by attaining a

small satellite launcher and suitably modifying it to launch anti-satellite weapons.¹¹

Cyber-Terrorism and Space Terrorism

Cyber-terrorism can act as a key element of terrorist acts in space. The security of power plants, traffic control systems, banks, and military installations are excessively dependent on the internet now. Space operations cannot be undertaken without a reliable internet system. Some incidents have shown that terrorist groups are capable of cyber-attacks. Recently, NASA computers were hacked and confidential data was downloaded to the hackers' computer.¹² It is also possible that the terrorists attack the satellite's command, control, or communication network by releasing a computer virus, thereby degrading or damaging the satellite.

Developing Vs. The Developed States- The Potential Targets of Space Terrorism

While working on devising solutions to the possible threat of such activities, one must first single out the potential targets. Innovation in space technology is developing at a fast rate in the last few years. What started as space exploration has now become a \$420 billion industry.¹³ Moreover, who are the key players in this industry? The developed states like the US, China, Russia and Japan are the major developers of space programs. While one cannot neglect the fact that most states are beneficiaries of these programs, the potential targets of space terrorism are the key players. There are two reasons associated with this inference: symbolism and a space dependency link.

The 9/11 attack on the world trade center and pentagon demonstrated the significance of symbolism in terrorism. The aim was not only to target the twin towers but also to destroy what was

considered a landmark of western civilization. The same stands true for the space tech. The remarkable accomplishments of space missions carry a high degree of symbolic significance. They signify a state's technological advancement. Hence, the targets of space terrorism would not be those who are the beneficiaries but those who are the primary stakeholders in space programs. States such as the US, Russia, China, Japan, and UK have substantial symbolic significance along with usefulness attached to their satellites stationed in space. Thus, a direct or indirect attack on these satellites will have emblematic repercussions. Another symbolic link of space terrorism will be the terrorist attack itself. The first hijacking of an El Al commercial flight by Popular Front for the Liberation of Palestine (PFLP) on July 23, 1968 shook the world. A space attack carried out for the first time would generate sufficient havoc to attract unprecedented media coverage and make nations to urgently deliberate a possible means to stop such attacks in future.

The second factor that makes the primary space actors a potential target is their dependency on space technology. America's "Operation Desert Storm" carried out against Saddam Hussain revealed to the world its dependency on space technology.¹⁴ Its heavy reliance on GPS to navigate its troops through Iraq demonstrated that a victory without the help of space technology would have been impossible. Similarly, Washington's use of thirteen satellites to send out three-dimensional triangularized locations is susceptible to attack by the terrorists organizations. Without much difficulty these organizations can develop jamming systems that may be capable of misguiding US missiles. In recent years, US military has spent millions to decrease this dependency but without much success.¹⁵ This dependence on space-enabled technology, connectivity and services is not just limited to the US. Many states in the European Union have increased their reliance on

space services. This dependency link makes the key space players more susceptible to attacks by the terrorist.

The Emergence of New Actors in Space

The sixty-year-old paradigm of state-led agencies dominating the space is slowly experiencing a shift. The space sector faces a swarm of privately owned companies that wish to invest in the billion-dollar industry. From providing services and equipment for space missions to space launchers, human spaceflight, space tourism, and asteroid mining. These companies are working to develop easier, cheaper, and faster ways to access the space.¹⁶ A few examples of these companies are SpaceX, Scaled Composites, Blue Origin, Virgin Galactic, Bigelow Aerospace, and the Sierra Nevada Corporation.

The increase in investment in space programs has led to what one might call the commercialization or privatization of space. The emergence of new actors in space brings with it the emergence of new challenges. Unlike before, when a small group of states and big aerospace industries dominated the space, these new actors are likely to transform the old stable system. As mentioned, the privatization of space will result in a decrease in the cost of space activities. While this does promise a sizeable increase in space development, it does have its fair share of drawbacks. Reduction in cost means increased participation. Furthermore if privatization continues at the same pace, soon it would not remain easy to regulate or control the actors in space. Hence, making it easier for terrorist groups to participate in space activities without attracting too much attention. In addition, reduced costs will allow them to develop their capacity to participate in sophisticated space activities.

While it is not possible to stop private companies from investing in space technologies, it is therefore essential to develop policies and guidelines nationally and internationally to regulate their conduct.

Establishing an international legal order for outer space should be seriously considered by the international community.

Role of International Organizations

The United Nations Treaty on Outer Space followed by the Liability Convention, Rescue Agreement, Moon Agreement and Registration Convention have helped establish a workable order in space. However, the low number of ratifications of these treaties by states suggest that states have not reached a consensus on how matters in space must be resolved. This is problematic for multiple reasons. Considering that states are dissatisfied with the terms of the treaties, new actors have made matters more complex. Entangled in the already increasing web of space actors, the United Nations has failed to consider the possibility of the arrival of a new actor i.e. terrorists. While it does conduct annual sessions to discuss the current and future activities followed by informal sessions that are open to member states, academia, non-governmental sector and the private sector.¹⁷ The absence of any efforts to counter the threat of terrorism puts a question mark on these assemblies.

The conspicuous absence of any clause stipulating the means for countering terrorism in space is one of the most significant loopholes in UN treaties for outer space. None of the articles of the conventions and treaties mentioned above addresses the possibility of an attack by a terrorist organization on astronomical objects. In case such an attack occurs, the UN will have no means to counter it. This deficiency in the treaties gives the terrorist organizations an upper hand in executing and accomplishing their objectives without fear of a co-ordinated international response. Not only has the United Nations failed to devise counter-terrorism strategies for space, but has also overlooked the very possibility of terrorism in space. To develop an effective approach to tackle such a threat, the organization must make an effort to explicate the

notion of space terrorism. It must specify the acts that fall within the ambit of terrorism in space. Once a consensus is reached, then articles related to counter-terrorism in space or counterterrorist tactics may be incorporated in the treaty. Moreover, UN can also aid states in developing policies to counter terrorist-based offences in space that may be directed at them or their satellite systems.

Preserving Peace in Outer Space

It is imperative to develop a set of international norms that regulate space activities and contemplate on matters involving the security of outer space. The first step would be to propose confidence-building measures to encourage space actors to engage in commitments for devising a counter-terrorist strategy for space. Developing or revising legally binding regimes or devising ones that compliment the current international legal regime would face several impediments. Since a proactive approach is required to tackle the possible threats of terrorism in space, the time-consuming nature of such developments would be counter-productive. Thus the appropriate approach would be to work on non-legally binding mechanisms including voluntary TCBMs.

A platform must be established that will allow space actors to exchange views on formation of general principles that ensure responsible behaviour and transparency. These should address challenges associated with terrorism in space, but at the same time should guarantee access to space technology meant for peaceful purposes.

In addition, it is vital to refine and promote behavioral norms that alongside reducing the threat of terrorism in space, would aid in coordination of space operations. Moreover, these norms should also focus on data sharing of space-based technologies to enhance international cooperation. Cooperation at this level will assist in building politically backed laws that would safeguard the security

of outer space reducing its chances of becoming an active amphitheater of conflict.

Developing a Counter-terrorism Policy for Space

While devising a policy for countering terrorism in space and keeping in mind the law of space policymakers can make use of three strategies:

1. A Political solution
2. A Military Solution-War Model
3. Criminal Justice Model

A political solution to the problem of terrorism in space suggests that such an activity can be tackled effectively if we address the motives of these organizations politically and diplomatically. This solution will help decrease dependence on military action, thus resulting in the peaceful eradication of possible threats of terrorism in space. In addition, a political solution is by nature long-term. Hence, other than a routine revision, potential amendments and side by side negotiations such a solution would ensure long-term peace. Moreover, it suggests that a diplomatic and political pathway will always be open for states to cooperate with each other, increasing chances of development of behavioural norms and principles for protection of space against terrorism.

In contrast, if we apply the War Model to counter space terrorism, states must use military and weapons to protect their space assets. This would lead to the weaponization of space, which includes introducing a defensive system or the stationing of more satellites for the surveillance and protection of the existing satellites. Moreover, given that terrorists do not own any space assets, using space-based weapons against them would be ineffective. In addition, if one actor chooses to enhance its capabilities, this raises concerns for the security of other actors in space, leading to security dilemma resulting in an arms race in space. The aim of

policy makers would be to avoid such an approach and devise a strategem that would increase costs for both states and non-state actors for taking part in military action in space. The reason for highlighting this model is to help actors comprehend the costs of this approach to tackling terrorism in space.

The third strategy that involves the use of the Criminal Justice Model suggests that any terrorist act carried out in space must be investigated by the state's judicial system whose space assets were attacked. This can only be possible once a coherent policy that is acceptable to all judicial systems is formulated. Such a policy presently does not exist. The United Nations including the International Court of Justice can help states achieve a consensus on the general principles of such a policy. While this may require time, strenuous effort and bringing all the actors to the negotiation table, this joint action would be a milestone achievement for sustaining peace in outer space.

Having surveyed the three models, it is evident that no one approach can help generate an efficient counter-terrorist policy. The policymakers must use all three approaches to establish a workable strategy since each model only addresses a part of the problem. Policymakers must focus on achieving international cooperation to counterterrorism in space rather than taking steps at the national level.

In addition, states must increase the overall cost of carrying out terrorist activities in space. By devising an applicable rational choice model, states can reduce the attractiveness of terror acts. This can either be done by increasing the opportunity costs, perceived costs, or material costs. Once terrorists see that participating in such activities will result in a negative sum game or in other words, will result in potential losses, they are likely to alter their behaviour. This is a preventive measure that policymakers can adopt to help deter the threat of terrorism in space.

Conclusion

The best way to counter terrorism is anticipating it rather than reacting to it. While the phenomenon of terrorism in space may seem farfetched to some, it is vital to address the matter before it becomes an unmanageable threat. Lack of attention to the issue of space terrorism is alarming. At present, no country has made efforts to develop its capabilities to deal with such a threat. However, it is not too late for state actors to make collaborative efforts to promote security in outer space.

The best approach to tackle the possibility of space terrorism is through international cooperation and partnerships. Rather than taking individual steps to enhance personal capabilities, both states and non-state actors should collaborate to develop protective and preventive measures. Since the threat perception and perceived urgency to address the threat may vary from state to state, the resources dedicated and policy choices will also vary. Nevertheless, the aforementioned strategies can be used as basis for developing a workable stratagem. The United Nations has a vital role to play in this regard. The organization can not only help reach a consensus on policy choices, but through confidence-building measures it can also convince states to contribute the required time and resources to counter terrorism related offenses.

Through a combination of collaborative political and diplomatic efforts, the cost of taking part in terrorist acts in space is likely to increase. Hence, diminishing or reducing the threat of space terrorism. The two models: 1) Criminal Justice Model 2) Rational Choice Model will allow policymakers to anticipate the possible motives and actions of terrorist, thus aiding in devising constructive policies are that compelling to all space actors alike.

Endnotes

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