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The Wave of Terrorism in Outer Space and a Call to Counter

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Abstract

Purpose: This essay will look at the potential impact of terrorist tactics in the outer space on space security, considering both the attacker's '*mens rea'*. This research aims to investigate various tactics that could aid policymakers in formulating a viable counterterrorism strategy concerning space.

Methodology: This study will be methodically carried out by briefing on the history of outer space terrorism, the concept of space terrorism , cases, theories, possibility, and suggest policies to counter space terrorism. A review of the literature will be conducted in order to understand the concept. To determine the gap in the international space law system addressing space terrorism, critical examination will be conducted. Articles, books, conference documents were used in the article.

Findings: Terrorism is a serious threat to global peace and security in space, taking advantage of technological advancements. Terrorist attacks can take many different shapes, but they are always the result of a series of events that frequently start with radicalization, the development of extreme opinions, and the embrace of violence as a tool for trying to bring about change. Although terrorist techniques have been used for hundreds of years, they have become more well-known in the last thirty years as a result of the widespread use of television and the internet as multipliers of fear. The 9/11 attacks in New York and Washington, DC, as well as the IRA bombs in London from 1971 to 2000 are two instances. In the same time frame, society's demand on space has grown significantly for daily needs. Many systems that affect daily life, such as financial markets, food distribution networks, communication, and navigation, depend on satellite technology.

Unique Contribution to Theory, Practice and Policy: Because of the significant effects that an attack on satellite systems would have on the majority of the world's population, terrorist organizations find them to be especially appealing. Even though there aren't many documented instances of space-related terrorism, it is nevertheless possible and cannot be disregarded that it will recur in various forms. Politicians at all levels—national and international—need to pay attention to it. The threat is apocalyptic since there is no discourse analysis and no definitional context for the topic.

Keywords: *Space terrorism, Space security, Space technology, Space industry, Satellites, Terrorism, Counterterrorism, Policymaker*

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1.0 INTRODUCTION

The world is becoming more and more dependent on space for both military and civilian needs, making space terrorism a possibility if not a certainty. Since the beginning of the space age, humanity has made incredible advancements in the use of space-based technology, such as the reusability of rocket boosters, new rockets under testing and development, such as SpaceX's Falcon Heavy and BFR, NASA's SLS, and Blue Origin's New Shepard; the increasing number of orbital launches (52 in 2005, 70 in 2010, 114 in 2018, and planned 173 in 2019); and the expanding space industry market (currently estimated at $350 billion, expected to nearly triple in 2040, and reach $2.7 trillion in 30 years), to the point where a considerable chunk of the modern state's infrastructure and economy—primarily in the form of satellites—rely on this kind of technology.(Bernat & Posłuszna, 2017)

The cost of these satellites has dropped dramatically due to advancements in manufacturing, making investments in space-based technologies affordable even for relatively poor states. However, given that both states and individuals depend more and more on satellite technology and that the cost of launching assets into orbit has been falling, there is a greater chance than ever before that state or non-state actors will use space as a theater of operations and launch attacks against space-based technologies. An attack on satellites and space stations could result in widespread casualties, infrastructure destruction, and disastrous ramifications for the states. Additionally, terrorists can accomplish their goals by taking advantage of gaps in the current definitions and guidelines on space terrorism.(Coleman et al., 2018a)

Although the majority of publications acknowledge that space is the future "high ground," they frequently focus on States as the primary actors and ignore the potential for terrorist involvement. This essay will demonstrate that terrorists, despite the assertion made by scholars, researchers, and policy leaders, mostly ignore the prospect of "space terrorism."

This essay will look at the possibility of committing acts of terrorism in space, the development of this new kind of terrorism, and define space terrorism. Since this subject is mostly ignored by counterterrorism professionals and policymakers, we shall identify the emerging non-state actors of the modern era, along with their goals, dangers, and capabilities.

1.1 A BRIEF HISTORY OF THE CONCEPT OF TERRORISM

Until recently, many of the tactical tools and methods of modern terrorism were based on the strategies used by States in their inter-state military engagements when it came to targeting. One particular argument is that, a century ago, terrorist codes that targeted victims were similar to professional military codes in that they respected the distinction between innocent civilians and soldiers or officials (such as in the case of the targeted assassination of Austria's Archduke Franz Ferdinand on June 28, 1914).[1]

According to the wave hypothesis, terrorist organizations come and go, and they have the ability to disintegrate when they can no longer motivate people to reject power via violence, take out grievances through violence, or demonstrate violently in response to political concessions being refused. "Anti-colonial wave," which began with the political idea of self-determination following World War I and

[1] (Walzer, 1977, pp. 197–234)

violently developed into a legal right following World War II (see, for instance, the Algerian Civil War and the Vietnam War). Other examples of this include the Aaland Islands arbitration in 1921.

Those who would later become post-war revolutionary terrorists and who also adopted more irregular weapons and forms of fighting, such as urban guerrilla warfare, were effectively trained by the industrialized and indiscriminate means and methods of warfare used during the two "total wars" of the twentieth century (e.g., in widespread disregard of the principle of distinction). In the modern world, indiscriminate weapons (such as WMDs, high-level bombing capabilities, and so forth) are a common occurrence. In terms of terrorist strategy, David Rapoport's seminal concept of the "waves" of terrorism (The Four Waves of Terrorism) offers a helpful method to conceive the evolution of modern terrorism as a recourse to revolutionary violence.(Nations Office Drugs, 2018)

This also shows that conditions within and shifts within social and political cultures have a discernable influence on terrorism and its motivations. For a long time, it was thought that having a material advantage—which would typically show up in the form of an army, a large number and high-quality weaponry, effective logistical support, and the state's financial capacity—was the cornerstone of military victory. Naturally, strong actors—primarily states—benefited from this kind of material advantage, which is why they typically emerged victorious in conflicts.[2] In the majority of asymmetric wars, as Ivan Arrequin-Toft shows in his study How the Weak Win Wars: A Theory of Asymmetric Conflict (2001),[3] i.e., such where the difference of potentials is 1:10, the strong adversary[4] usually wins (70.8% of conflicts).

That means that it did not win 29.2% of them, i.e., it was not able to realize the goals it adopted. Nonetheless, a shift occurred throughout the latter part of the 1900s. As if destined for failure from the beginning, the weak performers such non state actors started to acquire the upper hand. The theory that material power and strategic advantage are merely correlated was refuted by the fact that weak actors won 55% of conflicts between 1950 and 1998.(Bernat & Posłuszna, 2017) Parker and Sitter, in contrast, suggest that violent terrorist incidents happen globally less as a result of global waves and more as a result of terrorist actors' distinct motivations stemming from four goal-oriented strains: nationalism, socialism, religious fanaticism, and exclusionism.[5] These fundamental drivers don't occur in a chronological order; instead, one strain ends and another one emerges. Instead, they can influence various terrorist activities in accordance with their requirements by operating in parallel and occasionally overlapping.

1.2 UNDERSTANDING THE CONCEPT OF SPACE TERRORISM

Few studies have focused on the possibility of terrorism being sent into space.[6] Some would argue that there isn't a strong enough threat, however the causes of this condition have not yet been well

[2] Winning the conflict means, in this instance, to realize the adopted goals.

[3] The basis for I. Arrequin-Toft‘s consideration was an analysis of 197 armed conflicts that took place in 1800-1998 (2001: 93-128).

[4] A strong adversary is, according to I. Arrequin-Toft, such an actor, whose material potential tops the potential of its adversary or adversaries at least ten times; and conflict is defined as war, during which the number of casualties amounts to at least one thousand

[5] Parker and Sitter (2016)

[6] (Remuss, 2009; Coleman & Coleman, 2017; Lakos, 2007)

investigated[7]. As a result, this is where our attention is likewise drawn. We start by using our definition of "terrorism" to operationalize our thoughts.

The majority of individuals claim to understand what terrorism is, but oddly, no universally accepted definition exists. The use of violence or the threat of violence is the sole overarching theme shared by the literally hundreds of definitions that are currently in use. According to a metaanalysis conducted by A. Schmid and A. Jongman, the most common characteristics of terrorism were force and violence, which was mentioned in 83.5% of definitions, the political nature of the phenomenon, which was mentioned in 65% of definitions, and fear and terror, which was mentioned in 51% of definitions.[8]

Of course, there are a lot of factors that may be used to differentiate between various forms of terrorism. (In the sections that follow, we go over the three most popular sets of criteria, which by no means covers all the variations in terrorism.) Because of different theological presuppositions and ideological objectives, politically motivated terrorism can be classified into several categories, such as national liberation terrorism, left-wing terrorism, right-wing terrorism, and religious terrorism. Based on the domain in which it operates, terrorism can be classified into three categories: separatist terrorism (which seeks political, ethnic, or religious independence), international terrorism (such as aviation terrorism), and state terrorism (such as when authorities utilize it to combat guerrilla organizations).

Lastly, the typology of terrorism, which is based on variations in the locations of terrorist acts, is the most important for the purposes of this paper. Here, we make a distinction between cyberterrorism, land-based terrorism, aviation (air) terrorism, and marine terrorism.[9] As previously said, little research has been done on the topic of space terrorism, despite its mounting threat. That does not imply, however, that no thought or conceptual analysis has been done in relation to the topic.

Four definitions of space terrorism that aim to encompass the phenomena in its entirety as well as its different expressions have been proposed based on the literature study. They should be viewed as a basic beginning point for the process of selecting the cases that might initially be classified as space terrorism.

Since 1983, the US State Department has defined terrorism as "premeditated, politically motivated violence perpetrated against noncombatant targets by subnational groups or clandestine agents, usually intended to influence an audience." This definition is found in Title 22 of the US Code, section 2656f (d). In this context, military soldiers who were off duty at the time of the attack are considered noncombatant. Anyone who isn't officially involved in an armed conflict ought to be included. These particulars give rise to disputes on the definition of terrorism.[10]

As to Cain, space terrorism can be defined as "an act of violence committed by one or more individuals or groups to hinder the establishment of a space settlement and/or their objectives, which may include a spaceship or space station, during Man's space exploration" (p. 98).[11] This definition

[7] (Blount, 2019)
[8] (Schmid and Jongman, 2017: 5)
[9] (Mehmood & Ahmed, 2021)
[10] (Miller et al., 2019)
[11] Cain (2016)

may be deceptive since it considers all acts of terror or violence, regardless of their intended purpose, to be terrorist activities. Using that comparison, any assault on the advancement of space settlement, including theft, can be classified as terrorism.

Furthermore, this definition is quite ambiguous and leaves out harm that can happen on Earth and still be tied to the space industry even though it has nothing to do with colonization, such as cyberattacks on ground-based space systems, ground-based space stations, and rocket launch sites.[12] Bernat and Posłuszna define it as "[a] purposeful 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 a sector of human activity dedicated to producing components that go into Earth's orbit or beyond, delivering them to those regions, and services related to these processes".[13] This concept is also limited since it confines the space industry to the economic sphere, even though space transcends that. It includes aspects of national security, cyber security, culture, and society. Restricting it to terrorism that is motivated by economic gain leaves out terrorist acts that target other areas.

Mehmood and Ahmed propose understanding the phenomenon as "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"[14]

1.3 THEORIES OF SPACE POWER STUGGLE

Similar to power in international relations theory, spacepower is a multidimensional idea that is "complex, indeterminate, and intangible," in the words of Peter L. Hays.[15] Space power definitions emphasize the capacity to use space and prevent adversaries from using it, as noted by Colin Gray.[16] It took until much later for there to be coordinated attempts to define space power. The first official definition was offered by Lt Col David Lupton in his 1988 book On Space Warfare, A Space Power Doctrine. Lupton proposed that three features were contained in the well-respected definitions of land, sea, and air power put out by Mahan, Mitchell, Arnold, and others: 1) components of national power; 2) military and non-military purposes; and 3) systems that combine military and civilian functions.[17]

Lupton provided the following explanation in light of this:

[12] (Mehmood & Ahmed, 2021)
[13] (Bernat & Posłuszna, 2019, p. 32)
[14] (Mehmood & Ahmed, 2021, p. 95)
[15] Peter L. Hays, United States Military Space: Into the Twenty-first Century (Maxwell Air Force Base, AL: Air University Press, 2002).
[16] Colin S. Gray, "The Influence of Space Power upon History," Comparative Strategy 15, no. 4 (October–December 1996), 293–308.
[17] David E. Lupton, On Space Warfare, A Pace Power Doctrine, (Maxwell AFB, AL: Air University Press, June 1988), 6.

'Space power is the ability of a nation to exploit the space environment in pursuit of national goals and purposes and includes the entire Astronautical capabilities of the nation'.[18]

1.3.1 Realist Theory and Spacepower Theory

Realist theory can be investigated in all three of its major forms to comprehend its implications for spacepower. One of these is the classical realist theory of Hans Morgenthau, which explains that the territorial state pursues national interest, which is determined by a number of elements including geography, ideology, resources, and capabilities, in order to secure its existence in anarchic society. One could readily assume that spacepower is a manifestation of the power struggle that underpins international politics. Since space technologies have advanced, space has become an area of national interest. Theories about the ways in which governments handle international rivals on Earth can likewise be applied to space if such rivalries are projected there.[19]

While states are currently the entities that pose a threat to other states' space capabilities, terrorist organizations could pose a threat in the not-too-distant future by being able to launch an electromagnetic pulse attack that could destroy or impair essential electronic infrastructures, such as transportation, banking, and other financial infrastructures, as well as systems for the production and distribution of food.[20]

According to Kenneth Waltz's structural realism theory, units' (in this example, states') options are shaped by the international structure. Understanding unit-level behavior, in particular, requires an understanding of the international framework. The kind, quantity, and capacities of the units make up the structure. States that make up the international system now have access to previously unheard-of capabilities, such as interactive capacity, thanks to new technology. The degree of dependency has grown significantly. Bipolar and multipolar international systems provide states different alternatives when it comes to foreign policy. States align or conflict with one another according to structure. Due to the possibility that Mother Earth is light years away, space colonies may need to function quite independently. If these claims are accurate, they shed light on how structure—extrapolated from structural realist theory—would affect the spatial behavior of units.[21]

The domain of geopolitics theory is where the process of space theory is most developed in geopolitics theory. "The extension of primarily nineteenth- and twentieth-century theories of global geopolitics into the vast context of the human conquest of outer space" is the definition of *Astropolitik*, a concept he has devised.[22]This is a derivative of classical geopolitical theory. According to Everett C. Dolman, geopolitical theory developed for the Earth and its geographical setting can be transferred to outer

[18] Ibid., 7

[19] See especially Hans Morgenthau, Politics among Nations: The Struggle for Power and Peace (New York: Alfred A. Knopf, 1960), 3–15

[20] This type of threat is described and discussed in the Report of the Commission to Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack, vol. 1, Executive Report (2004)

[21] Kenneth M. Waltz, Theory of International Politics (Reading, MA: Addison-Wesley, 1979).

[22] Everett C. Dolman, Astropolitik: Classical Geopolitics in the Space Age (London and Portland, OR: Frank Cass, 2002), 1

space with the "strategic application of new and emerging technologies within a framework of geographic, topographic, and positional knowledge."[23]

1.3.2 Constructivism

Constructivism has a radically different perspective on the world. According to constructivism, the best way to understand the fundamentals of global society is to analyze its laws, customs, agents, declarations, social structures, and interpersonal connections. Constructivism is an ontology—a view of the essence of being and a manner of seeing the world—rather than a theory. The world is constantly being "constructed" and therefore changed as new geopolitical, geoeconomic, or geostrategic changes take place. Such changes occur in a setting in which a "vast part of the planet [is] also changing 'internal' ways of running [its] political, economic, and social affairs. No part of the world can avoid these changes or their consequences; the entire world is continuously 'under construction."[24]

This means that explanations based on states, power dynamics, anarchy, or national interest are insufficient, if not deceptive, as these phenomena are abstractions that are "constructed" in our thoughts rather than actual objects with a physical actuality. As opposed to this, human interactions are intrinsically social since they are shaped by the social agreements formed by free-willing individuals or groups. The way we formulate and build "rules, as opposed to fictitious, artificially unified entities like states or structures, is what matters. Rules are visible to everyone and have ontological substance.[25]

1.3.3 Neoliberal Theories and Space

Space may serve as both the foundation for collaboration and as a place for rivalry. One can apply a wider range of IR theory to our conception of space by taking into account this statement, which goes beyond neoclassical realist theory. A liberal democracy does not wage war on another liberal democracy, for instance, according to the democratic peace theory (DPT). While the United States and the Soviet Union formed cooperative relationships during the Cold War, such states are more likely to collaborate with each other in space initiatives than they are with totalitarian countries in space or in other undertakings. Liberal theory holds that cooperation in one sector may produce satisfaction that enhances incentives to collaborate in additional sectors, leading to what Ernst Haas termed "spillover" or the "expansive logic of sector integration."[26]

1.4 CASES OF SPACE TERRORISM

Since 1972, there have been several terrorism, and piracy incidents that can be linked to the Space Industry, and these are set-out in Table 1: Space Terrorism and Piracy Incidents List (1972 – 2018). While some of these incidents are historically known events, others in particular the hacking events

[23] Everett C. Dolman, "Geostrategy in the Space Age: An Astropolitical Analysis," in Geopolitics: Geography and Strategy, ed. Colin S. Gray and Geoffrey Sloan (London and Portland, OR: Frank Cass, 1999), 83
[24] Vendulka Kubalokova, Nicholas Onuf, and Paul Kowert, eds., International Relations in a Constructed World (Armonk, NY: M.E. Sharpe, 1998)
[25] Ibid
[26] Ernst Haas, Beyond the Nation-State (Stanford: Stanford University Press, 1964), 48.
[27] (CNET, 2002).

are disputed. Britain's Ministry of Defence denies its military communications satellites were hacked in a 2002 incident.[27]

In general, the following patterns can be noted: (1) threats of murder and kidnapping (1972); (2) the bombing of the Space Agency (1984); (3) numerous hacking incidents (1999-2018); (4) the attack on the launch pad (2003); and (5) letters threatening terror attacks at a facility run by a space research organization (2013). Thus far, the trend pattern corresponds with the historical evolution of terrorism and extreme violence, which has moved from killings, kidnappings, and bombs to the more recent and pervasive use of hacking, cyberattacks, and communications piracy.

A twenty-year-old U.S. Air Force ship known as Defence Meteorological Satellite Program Flight 13 (DMSP-F13) exploded in 2015. Allegations of potential sabotage have been made in space terrorism literature. According to Bernat, the official explanation provided by US officials for the incident was a power outage, which downplayed its importance.[27]

It has been claimed that the public delay in admitting the incident was an attempt to hide an,

"Actual act of sabotage … Of course, for obvious reasons, it is difficult to determine what truly happened."[28]

A scenario commonly identified in the Space Terrorism literature, is where an entity or group acting illicitly, get a commercial launch provider to put a satellite into orbit, for what would otherwise be a legitimate Space Industry activity. This situation was claimed in the case of,

"The launch of four rogue satellites on Indian PSLV launch vehicle on 12 January 2018."[29]

The satellites belonged to Swarm Technologies – a Space start-up based in California. The company had originally been denied placing them in orbit, the:

"Denial of the experimental license was based on concerns the satellites were too small to be effectively tracked by the U.S. Military's Space Surveillance Network (SSN), which provides safety of flight information to other operators.

Subsequent to the unlicensed launch, the FCC revoked another Swarm license for a planned upcoming launch on Rocket Lab's Electron in April 2018. As of March 23, 2018, neither Swarm nor any of its known investors have commented on the situation."[30]

A basic question licence denial instances raise is that of forum shopping. This is where an entity or group are able to find a launch provider in another country, or through third-parties, and get access to a launch with little in the way of international scrutiny. It has been noted that:

"If it was possible for an American company to place in the orbit unlicensed satellites, it seems, that any other agent, including weak actors adversaries … could do the same."[31]

[27] Bernat (2019)
[28] Ibid
[29] Ibid
[30] (Christensen, 2018)
[31] (Bernat, 2019)

TABLE 1: SPACE TERRORISM AND PIRACY INCIDENTS LIST (1972 – 2018)

1	1972	The Black September Palestinian Group threatened an attack against the Apollo 17 mission, specifically to murder or kidnap the crew or their families.
2	1984 (3 August)	Six persons were hurt when Action Directe, a left-wing French organization, bombed the European Space Agency's Paris offices two days prior to an Ariane satellite launch.
3	1999 2002: The same/similar incident is reported.	Hackers used a home computer to take over a British military communications satellite. One of the satellites in Britain's Skynet system, which provides communications services to the Royal Air Force and other armed forces units, was reportedly affected by the same or a similar occurrence and was taken over the course of a weekend by hackers. After the attack, the British government allegedly received a threat of blackmail.
4	2002 (June)	The broadcast signals of ten provincial stations and nine China Central Television stations were hijacked by the Falun Gong Spiritual Movement in China, which substituted the content with its own.
5	2003	Because there was an Israeli astronaut on board, NASA decided to step up security for the Columbia shuttle launch because they were worried that al-Qaeda would attack the launch pad.
6	2004	During four hours, AsiaSat transmissions were interfered with by China's Falun Gong Spiritual Movement.
7	2006	Three widely spaced locations throughout Libya had a jammed mobile satellite communication signal offered by Thuraya Satellite Telecommunications.
8	2005–2007 (April)	The Liberation Tigers of Tamil Eelam (LTTE) of Sri Lanka have successfully compromised Intelsat Ltd. through hacking. For nearly a year, without Intelsat's knowledge, they beam their propaganda into Sri Lanka and throughout the Indian subcontinent using an unoccupied Kuband transponder on an Intelsat-12 satellite in geosynchronous orbit. Intellect Satellite continuously tried to interrupt LTTE's pirating. But for two years, the LTTE was able to carry on with their satellite pirate. In late April of 2007, Intelsat made the decision to decommission the satellite transponder.
9	) (October) l (September)	Over 5,400 instances of malicious software or unauthorized access occurred on NASA systems; in certain cases, the affected networks were said to be fully controlled by the perpetrators.
10	2013	At an Indian Space Research Organization site in Bangalore, India, a note threatening terror threats was discovered.
11	2015	The hacking organization Anonymous compromised the European Space Agency, causing thousands of credentials to be exposed.
12	2015	Malware that might have allowed hackers to manipulate satellite separation and rocket launches was found on a computer belonging to the Indian Space Research Organization.
13	2018 (Admitted). Events prior to 2011.	Insurgency used jamming during Operation Iraqi Freedom (2003-2011). Deliberately jammed commercial satellite communications links used by the U.S. military.

In the literature on space terrorism, the issue of shutter control has also been brought up in regard to terrorists and extremist use of space. There is minimal national or international regulation of commercial companies' use of remote sensing satellites to gather high-quality real-time intelligence, which is the source of the problem.[32]There is a possibility that terrorists and extremists could obtain commercial satellite imagery to guide their planning, targeting, and postattack analysis procedures. In the early 2000s, this situation was recognized:

"A terrorist organization could also use commercial images to learn exactly where the troops of a target state are and how their facilities (embassies, military bases, etc.) are laid out. A terrorist attack on the model of the attack of the American vessel USS Cole in the port of Aden in October

2000 could be organized using Space imagery."[33]

2.0 THE '*MENS REA*' OR MOTIVES OF SPACE TERRORISM

The act of space terrorism is more suited to achieving the aims of the terrorist groups and 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.[34]

This essay uses the following working definition of "terrorism," even though there is currently no agreed-upon definition at this time: the purposeful incitement and use of violence or the threat of violence to incite fear in the name of political change (..), with the intention of producing psychological repercussions that extend much beyond the immediate victim(s) or target of the terrorist attack.[35]

Suicide is sometimes called "the main weapon," although counterterrorism specialists say that suicide is rarely the first option employed—rather, it is used only in cases where other options are ineffective.(Mehmood & Ahmed, 2021) The process is not a necessary component of the destructive act; rather, it is a means to an end. Terrorist organizations will thus employ any technique as long as it is simple to obtain and effective in causing large-scale casualties and/or a long-lasting psychological impact.[36]

Targets are usually chosen with regard to the accomplishment of a symbolic purpose and there is thus an open-ended category of targets. While specialists agree that terrorists' operations and tactics reveal a remarkably low degree of innovation in contrast to a very high degree of imitation, foresight is crucial in contingency planning.[37] Therefore, in order to anticipate new tactics that terrorists may

[32] (Townsend, 2021)

[33] (Nardon, 2002)

[34] (Remuss, 2009)

[35] Hoffman, Bruce. Inside Terrorism. New York: Columbia University Press, 2006. 40. Alex P. Schmid discusses more than one hundred different definitions of terrorism, trying to offer a reasonably comprehensive explication of the word, cf. Schmid, Alex P. Political Terrorism: A Research Guide. New Brunswick, N.J.: Transaction Books, 1994. For another discussion on the definitional question of terrorism cf. Laquer, Walter. The Age of Terrorism. London: New Brunswick, N.J.: Transaction Books, 2001.

[36] Crenshaw, Martha. Terrorism in Context. Pennsylvania: Pennsylvania State University Press, 1995; Bloom, Mia. Dying to Kill: The Allure of Suicide Terror. New York: Columbia. Chapter 1; Gormley, Dennis M. op. cit. 7.

[37] Juergensmeyer, Mark. Terror in the Mind of God. The Global Rise of Religious Violence. London: University of California Press, 2000. 14; Hoffman, Bruce. Inside Terrorism. New York: Columbia University Press, 2006. 230;

employ in the future, policymakers must put themselves in the terrorists' shoes and anticipate new dangers that might arise throughout time. Terrorists will probably look for new ways to cause harm as the globe moves forward with its defense strategies. Terrorists would find it appealing to strike the US with cruise missiles launched from orbit because of its heavy reliance on satellites and other space-based equipment.

2.1 TERRORISM IN STATE AND SPACE OPERATIONS

In his 2017 National Security Strategy (NSS), President Donald J. Trump argues that 'great-power competition will resume, naming China and Russia as specific competitors'. He also emphasized the importance of reiterating the importance of space for both military and commerce. The president advocated for the development of a Space Force shortly after the NSS was published, at least in part to protect US security and commercial interests in space. On February 19, 2019, he signed Space Policy Directive-4, directing the Pentagon to establish a Space Force.[39]

A variety of anti-space technologies, such as computer viruses, jamming, lasers, and antisatellite missiles, are still being developed by China and Russia. That being said, being attacked in space is very different than ceding space superiority to other superpowers. Although space will see rivalry as part of great-power conflict, it also sees a great degree of collaboration, such as between the US and Russia and with the International Space Station.[40]

A rogue state could use space for military objectives, given the speed at which space innovation is developing. For instance, North Korea has been testing its ICBMs recently to see if it can use such weapons against the USA and Japan. If they felt that doing so would benefit them, it would not be surprising to see those conducting space-based military operations. A space assault with no specific target in mind could be launched by a rogue state with launch capabilities, like North Korea, and there are two possible methods such an attack could be executed.

North Korea is known to possess nuclear materials, and thus it could produce a nuclear EMP and detonate it in orbit, causing massive and widespread damage to the electronic systems of any satellites within range. However, in the event that North Korea was to develop such a device it.

Simpson, Bruce. "A DIY Cruise Missile - Answers to Frequently Asked Questions". Updated: July 2003. 01 Sept. 2008..

[39] In a statement at the beginning of the third meeting of the revived National Space Council, President Trump said, "I'm hereby directing the Department of Defense and the Pentagon to immediately begin the process necessary to establish a Space Force as the sixth branch of the armed forces." Sandra Erwin, "Trump: 'We Are Going to Have the Space Force,' " Space News, 18 June 2018, https://spacenews.com/trump-we-are-going-to-have-the-space-force/; and Mike Wall, "Trump Signs Directive to Create a Military Space Force," Space.com, 21 February 2019, https://www.space.com/president-trump-space-force-directive.html.

[40] Hanna Krueger, "In Space, U.S. and Russia Friendship Untethered," NBC News, 30 September 2017, https://www.nbcnews.com/news/us-news/space-u-s-russia-friendship-untethered n806101; and Simon Saradzhyan and William Tobey, "US- Russian Space Cooperation: A Model for Nuclear Security," Bulletin of the Atomic Scientists, 7 March 2017, https://thebulletin. org/2017/03/us-russian-space-cooperation-a-model-for-nuclearsecurity/.

seems highly unlikely that it would be utilized in this manner, rather than being loaded into an ICBM.[38]

The presence of space debris in Earth's orbit poses a significant risk to both manned and robotic space missions. Since objects in low Earth orbit travel at a speed of 7-8 km/sec, even a tiny piece of debris can cause a significant amount of force when it collides with them. Thus, relatively small debris particles have the potential to cause serious harm to satellites, whereas bigger debris particles have the power to disable or even destroy much larger spacecraft. If the density of objects in orbit is high enough, then collisions between objects may have a cascading effect, whereby each collision produces more space debris, increasing the likelihood of future collisions, which will in turn produce even more debris. This is because each impact with a satellite creates new pieces of debris, and impacts between pieces of debris can also cause the creation of new smaller pieces of debris.

2.2 TERRORSIM AND SPACE OPERATIONS IN NON STATE

Satellites are known to be vulnerable to physical attacks, and this has been demonstrated by antisatellite missile tests conducted by China in 2007 and by the actions of the USA, which shot down a malfunctioning satellite in 2008.[39] All the same, since a satellite in low-Earth orbit is probably moving at about 7 km/sec, direct strikes like these, which target specific satellites, call for an extraordinarily high level of precision. For this reason, it is highly likely that no one other than a powerful state could launch such an attack.

It is possible that a non-state actor may "take up arms" in space at some point in the future by purchasing a cheap satellite with the intention of utilizing it to launch direct strikes against other spacecraft in surrounding orbits. The satellite would have to be specially built to enable such an attack, which would pose challenges in and of itself. However, these challenges pale in compared to the additional challenges that such a project would entail.[40]

Guerrillas and terrorists are the two categories of non-state actors that are the subject of this article and have political goals. Guerrillas and terrorists are two violent political players that might be interested in assaulting a nation's space assets. The distinctions between these two groupings are frequently seen as scholarly and influenced by one's point of view on a dispute. Because of this difference, terrorists view the populace as a tool that their group must utilize to further its objectives, but guerrillas view the populace as their base of support that needs to be won over and taught about the cause.[41]

One way to distinguish between groups that target civilians and combatants is that guerrilla forces typically consist of larger groups, but terrorist organizations may consist of a small number of individuals. Their behavior is significantly impacted by this distinction in multiple ways. In order to obtain autonomy or independence from their current government or to eventually overthrow it during

[38] (Coleman et al., 2018b)
[39] T. Shanker, Missile Strikes a Spy Satellite Falling From Its Orbit, New York Times, 21 February 2008, http://www.nytimes.com/2008/02/21/us/21satellite.html ?ex=1361336400&en=ea5702ff269483cc&ei=5088&partner=rssnyt&emc=rss, (accessed 6 September 2017).
[40] (Coleman et al., 2018b)
[41] (Miller et al., 2019)

the revolution, guerrillas typically seek to seize and retain territory. Typically, terrorists would rather not seize territory or are too small and weak to accomplish so.

Furthermore, guerrillas are structured hierarchically, akin to a traditional military organization, and they are more prone to employ conventional military techniques. Terrorists are more likely to employ unorthodox attack methods and to be arranged into cells or according to the theory of leaderless resistance, which holds that tiny cells function independently of one another and from the leaders of the larger organization.[42]

These structural variations also affect how groups behave and how vulnerable they are to government actions.[43] Nevertheless, by participating in both guerrilla warfare and terrorist actions, the groups themselves frequently muddy the lines between the two. As more satellites in orbit develop dual-use capabilities, such as the ability to target the Global Positioning System (GPS) constellation, the lines between military and civilian applications will probably become even hazier.

In their fight against a foreign power that they perceive as an invading army, guerrillas are frequently domestic groups that aim to overthrow their own government and create an independent state. In the past, a lot of these groups were driven by a revolutionary cause that called for a radical overhaul of the political and social structures of the country (the Revolutionary Armed Forces of Colombia, for instance, or Peru's Shining Path, which adhered to Maoist doctrine).

The insurgency's use of jamming during Operation Iraqi Freedom was one instance. Insurgents purposefully interfered with commercial satellite communications systems that the US military employed, according to the "Space Threat Assessment 2018."[44] We should also anticipate that groups will employ any new technology that become available to conduct multi-domain attacks due to the similarities between cyberspace and space. Using a home computer, hackers took over a British military communications satellite as early as 1999. Historically, guerrilla organizations have used a range of cyberattack techniques, primarily to threaten governments or prevent them from receiving services. For instance, the LTTE, the previously mentioned, now-defunct Tamil insurgent organization in Sri Lanka, frequently waged guerilla warfare against the Sri Lankan military in addition to carrying out terrorist acts.

Terrorist strikes against space capabilities could take many different shapes for a multitude of reasons. Similar to guerrillas, terrorists may be motivated by nationalism or revolutionary philosophy, but they may also kill people in order to further their objectives. Terrorist groups also use it for various purposes, some of which may be national, international, or regional in scope. Examples include opposition to technology, religious differences, or simply being a part of a neoanarchist movement that aims to stop governments from using space exploitation to further their own dominance.

[42] Louis Beam, a white supremacist leader, wrote one of the earliest works on this model. Beam, "Leaderless Resistance," The Seditionist, 12 February 1992, http://www-personal.umich.
edu/~satran/PoliSci%2006/Wk%20111%20Terrorism%20Networks%20leaderless-resistance. pdf.

[43] everal authors examine how a group's organizational structure influences its behavior. For example, Victor Asal and Karl Rethemeyer, "The Nature of the Beast: Organizational Structures and the Lethality of Terrorist Attacks," Journal of Politics 70, no. 2 (April 2008)

[44] Todd Harrison, Kaitlyn Johnson, and Thomas Roberts, "Space Threat Assessment 2018,"

Although targets associated with their objectives are frequently attacked by terrorists, they also occasionally target symbolic targets or targets meant to provoke a response (typically an exaggerated one from the government). Al-Qaeda carried out the 9/11 attack primarily to achieve a collective goal, but it also had a symbolic purpose and prompted a response from the US.[45]

3.0 THE POSSIBILITY OF SPACE TERRORISM

Drawing comparisons to the way terrorists were able to utilize commercial aircraft during the 9/11 attacks, the head of the United Kingdom's new Space Directorate issued a warning that expanded access to space enhances the risk of "space terrorism."

"We all have witnessed what happens, and what particularly happens when the air domain became accessible to all — terrorists turned airliners into weapons. If such a trend holds true for space, when will we have to deal with our first example of space terrorism? And are we prepared for such a dramatic strategic shock?" said Air Vice Marshal Harvey Smyth at the DSEI 2021 conference in London Sept. 14, just days after the 20th anniversary of 9/11.

When US Undersecretary of State Robert Joseph alerted the public about possible terrorist assaults against US space assets in 2006 at the George C. Marshall Institute, he brought attention to the possibility of terrorism in space.[46] This is consistent with Nicolas Peter's report in the Yearbook on Space Policy for 2006–2007, which makes the case that transnational players are becoming more capable of interfering with space assets and have a greater role in doing so.[50] "Space Terrorism" falls into three different types. (1) Countermeasures for satellites[47] (2) attacks on launch facilities and attacks on ground stations and (3) attacks on the user/service equipment.[48]

The most direct way to eliminate a satellite is to destroy it. An attack against satellites or an attempt to hijack them can cripple any state in today's digital world since they rely 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.[49]

On the other hand, there are a few choices available if the sole goal is to prevent an operator from profiting from its access to satellites: destabilization, denial, degradation, and deception of the relevant space system. The vulnerability of a satellite varies depending on its intended use.

[45] (Miller et al., 2019)

[46] Joseph, Robert. "The U.S. National Space Policy". Washington D.C.: The George C. Marshall Institute, 2006. [50] Peter, Nicolas. "The security dimension." Yearbook on Space Policy 2006 / 2007 – New Impetus for Europe. Eds. Kai-Uwe Schrogl, Charlotte Mathieu and Nicolas Peter (eds.). Vienna: Springer, 2008. 70.

[47] Today, satellites are the main focus of military space activities. During the 2004 Iraq war 68% of munitions were satellite guided. Parliamentary Office of Science and Technology. "Military Uses of Space." Postnote Dec. 2006, 273. 1.

[48] (Remuss, 2009)

[49] "What Are Satellites Used For?," Union of Concerned Scientists, 13 February, 2014, https://www.ucsusa.org/resources/what-are-satellites-used.

Vulnerabilities vary throughout instruments.[50] Military systems are better protected than commercial satellites, but the latter are increasingly used for military purposes as well.[51]

The frequency of hijacking and jamming incidents is rising. In 2006, the Abu Dhabi-based Thuraya Satellite Telecommunications identified three distinct locations in Libya as the source of a deliberate, months-long mobile satellite jamming campaign.

Some Libyan nationals were responsible for this significant jamming incident that was captured by commercial satellite services. They were using Thuraya satellite phones to smuggle Marlboro cigarettes into Libya from Chad or Niger[52] to communicate with each other.

In order to keep the Libyan officials from listening in on their talk, they attempted to interfere with the transmission signals. But they managed to interfere with signals not only inside Libya but even outside its borders by jamming them extensively. As a result, when Thuraya attempted to launch a third satellite in an attempt to broaden its network, it sustained enormous losses. When one considers that a group of cigarrete traffickers in Libya in 2006 were able to block signals outside of the country, one has to wonder what terrorists are capable of 14 years later.[53]

Furthermore, two similar events happened in China, where China's Falun Gong spiritual movement in June 2002 overrode the broadcast signals of nine China Central Television stations and 10 provincial stations and replaced the programming with their content and in 2004 disrupted AsiaSat signals for four hours.[54]

Also, in the 1950s the "Moonwatch Program" as well as the Kettering Group proved that this required only a minimal technology approach: amateur satellite observers used stopwatches, sky maps, personal computers and sometimes binoculars to determine satellites' orbital elements. Hence, tracking can be done using common and inexpensive electronics with minimal training.

This is in line with U.S. Undersecretary of State Robert Joseph's concern about non-governmental satellite observers tracking satellites and posting their orbits on the internet, which can possibly by use by terrorist organizations.[55]

Electronic interference refers to the first type and is also the most straightforward way to interfere with a satellite. This includes jamming or spoofing the satellite's signal or its up- or down-links. Jamming is the process of "using a signal at the same frequency and higher power" to overwhelm signals sent to or from a satellite in order to disrupt communication. It can be as simple as creating

[50] Chun, Clayton K. S. op. cit. 24; Daly, John C. K. "LTTE: Technologically innovative rebels". Security Watch 5 June 2007. 1 Sept. 2008.

[51] In operation "Iraqi Freedom", commercial satellites provided 80% of U.S. data, compared to only 45% in "Desert Storm". Parliamentary Office of Science and Technology. op. cit. 4.

[52] Libya Pinpointed As Source of Months-Long Jamming in 2006," SpaceNews, 29 June, 2004.

[53] Ibid

[54] Daly, John C. K. op. cit.; Peter, Nicolas. op. cit. 70; Space Security Summary 2008. Ontario: Project Ploughshares, 2008. 20.

[55] Joseph, Robert. "The U.S. National Space Policy". Washington D.C.: The George C. Marshall Institute, 2006.

[60] Wright, David, Laura Grego and Lisbeth Gronlund. "The Physics of Space Security: A Reference Manual." Cambridge, American Academy of Sciences: 2005

"meaningless noise" that drowns out the real signal at the receiver, causing malfunctions that can be temporary or permanent.[60]

In addition, one can think of direct ascent weapons, direct energy weapons, orbital weapons and direct energy beams, aiming at destroying the satellite as a whole. Such ASATs however require several elements to accomplish their mission successfully:

1) The delivery mechanism selection is influenced by the type of target and booster. 2) Requirement for a dependable booster system with a big enough payload.

3) Necessitates intensive crew training and maintenance. 4) A comprehensive system of tracking and surveillance that is based in space, the air, and the ground.

5) Requires a way to deflect its target so that it is within the weapon's effective range. 6) The target must have enough "kill" power to be destroyed or rendered inoperable.

7) The capacity to ascertain whether the target has been neutralized or needs to be attacked again.[56]

Laser strikes against satellite sensors fall under a different heading. Direct energy weapons have the ability to interfere with or damage satellite sensors. Partial blinding, on the other hand, involves the use of sufficiently intense laser light to permanently harm the sensors of imaging satellites. This can be achieved by flooding a satellite's optical sensor with light that is brighter than the target it is trying to image. Moreover, lasers have the ability to cause thermomechanical strains, structural damage, and the melting of materials or delicate electronic connections.[57]

An explosion of a nuclear bomb at 250 kilometers above low Earth orbit (LEO) would destroy all unshielded satellites in the explosion's line of sight and produce an intense electromagnetic pulse

(EMP), making it the fourth and most destructive potential measure against satellites. Furthermore, for months or years, high altitude satellite contact with their ground station would be challenging, if not impossible, due to the radiation environment. If terrorists were armed with a nuclear weapon and a medium-range missile to deliver it, they would most likely choose this approach due to the efficiency of an EMP attack.[58]

A series of attacks could result in an incapability of armed forces or mass panic: starting with the blinding of a signal intelligence satellite, which in turn will be unable to indicate the destruction of a military communication satellite, leading to an incapability to monitor any battlefield, being followed by a destruction of the available launch facilities, making the replacement of the destroyed satellite impossible.[59] Hence, terrorists can achieve their main objectives of mass casualties and long-lasting psychological effects by engaging in space terrorism.

3.1 CYBER-TERRORISM AND SPACE TERRORISM

Space terrorism also includes cyber-terrorism. The excessive reliance on the Internet has put the security of banks, power plants, military sites, air traffic control centers, and other communication

[56] (Remuss, 2009)

[57] Wright, David, Laura Grego and Lisbeth Gronlund. op. cit.. 123-5; 128 & 134.

[58] Wright, David, Laura Grego and Lisbeth Gronlund. op. cit. 138-9; Chun, Clayton K. S. op. cit. 26.

[59] For a similar account cf. Baum, Michael E. Lt. Col. “Defiling the Altar – The Weaponization of Space.” Airpower Journal (Spring, 2004). 02 Sept. 2008

networks at risk. The aspect of space operations that is most vulnerable is growing Internet usage. It has been reported that terrorist organizations such as Hamas and Al-Qaeda have the capability to launch cyberattacks. There were rumors that seven NASA computer servers had been compromised shortly after the Columbia disaster.[60] It's also conceivable that the terrorists compromise the satellite by distributing a computer virus that compromises or damages the satellite's command, control, or communication network.[61]

4.0 A CALL FOR COUNTER-TERRORISM POLICY IN SPACE

Policymakers must create a space-specific counterterrorism policy because the threat of "Space Terrorism" is both actual and latent. Three primary techniques comprise a counterterrorism policy that, from a theoretical perspective, aims to preserve liberal democracy and the rule of law:

(1) The Political Pathway,

(2) The Military Solution also known as the War-Model and

(3) The Criminal-Justice Model, which has in the past been favoured by the EU.[62]

A political approach to addressing space terrorism implies that we should approach the goals of these organizations diplomatically and politically in order to effectively combat such activities.

The implementation of this approach is expected to reduce reliance on military action and pave the way for the peaceful elimination of potential terrorist threats in space. Political solutions are also by their very nature long-term. Thus, a solution like this would guarantee long-term peace in addition to routine revisions, possible adjustments, and side-by-side talks. In addition, it implies that states will always have diplomatic and political avenues through which to collaborate, raising the likelihood that standards and guidelines for space defense against terrorism will be developed.

On the other hand, states must deploy force and weaponry to defend their space assets if we apply the War Model to counterspace terrorism. This would lead to the weaponization of space,[63] which entails setting up a defense system or putting additional satellites in place to monitor and safeguard the current ones. Furthermore, it would be useless to use space-based weaponry against terrorists as they do not possess any space assets. Furthermore, if an actor decides to improve its capabilities, this poses questions about the security of other actors in space, creating a security conundrum that could spark an arms race.

The goal of policy makers would be to steer clear of this course of action and come up with a plan that would make it more expensive for states and non-state entities to engage in space warfare.

According to the third tactic, which makes use of the Criminal Justice Model, any act of terrorism committed in space should be looked into by the state's legal system, whose space assets were targeted. This is only feasible after a logical policy that satisfies the needs of every legal system has

[60] Davey Winder, "Confirmed: NASA Has Been Hacked," Forbes, 20 June, 2019,

[61] (Mehmood & Ahmed, n.d.)

[62] Wilkinson, Paul. Terrorism and the Liberal State. London: The MacMillan Press Ltd., 1977. 121; cf. Pedahzur, Ami and Magnus Ranstorp. “A Tertiary Model for Countering Terrorism in Liberal Democracies: The Case of Israel.” Terrorism and Political Violence 13.2 (2001): 1-26.

[63] According to the Space Security 2008 Index, the U.S. continues to pursue a space-based satellite protection and is thus favouring the military approach. Cf. Space Security Summary 2008. op. cit. 21.

been developed. There isn't one of these policies at the moment. States can come to an agreement on the general tenets of such a strategy with the assistance of the United Nations, which includes the International Court of Justice. The requirement for an independent police force and court system makes it difficult to decide which nation will handle a case involving cooperative space systems or several systems under attack.

This cooperative move would be a landmark accomplishment for maintaining peace in space, even though it might take some time, intense effort, and getting all the players to the negotiating table. It is evident from an examination of the three potential counterterrorism strategies that none of them—especially not in space—will be sufficient to create a successful counterterrorism program. As a result, since each type of legislation only tackles a portion of the issue, policymakers must combine the three methods.[64]

Such a counterterrorism policy for space must involve a common European export control regime with the goal of achieving transparency in the transfers of conventional weapons as well as dualuse goods and technologies. It must also include provisions on disarmament in line with the outcome of the peaceful use of space negotiations,[65] seeking for worldwide notices for all machinery, systems, and specially made parts that would allow aircraft to be transformed[66] into ASATs.

The policing model is one potential course of action. A police paradigm would be centered on obtaining intelligence, stopping damaging operations in space, regulating commercial operators, and, where necessary, coordinating efforts with military organizations to address nonstate/terrorist groups that are organizing and carrying out terrorist acts in space. The strategy would have the biggest effect on commercial operators' oversight and on cooperating with them to obtain information about possible non-state actors preparing terrorist attacks on space assets.

A community-based policing approach, in particular, would foster contacts inside the space sector and seek to establish alliances and countermeasures to lessen the likelihood of terrorist attacks by non-state actors.[67]

Furthermore, rather than pursuing individual initiatives, policymakers should concentrate on global collaboration in the fight against terrorism in space. A globally coordinated effort might be based on the Counter-Terrorism Policy for Space of international organizations.

4.1 ROLE OF INTERNATIONAL ORGANIZATIONS

New players have added to the complexity of the situation since states are not happy with the provisions of the accords. The UN has neglected to take into account the potential for the entry of terrorists as another participant in the already growing web of space stakeholders. Even while it holds yearly meetings to discuss its ongoing and future initiatives, there are other unofficial meetings that are open to member states, academic institutions, the non-governmental sector, and the commercial sector.[68]

[64] Pillar, Paul. Terrorism and U.S. Foreign Policy. Washington D. C.: THE BROOKINGS INSTITUTION, 2003. 29.
[65] The U.S. issued in 2003 a proposal to the Wassenaar Arrangement
[66] Gormley, Dennis M. op. cit. 8
[67] (Coleman et al., 2018b)
[68] Robert.wickramatunga, "UN-Space," UNOOSA, 3 January, 2021.

These gatherings are called into question by the lack of any initiatives to combat the threat of terrorism. Among the most important gaps in UN space treaties is the glaring absence of any provision specifying the methods for combating terrorism in space. The prospect of an assault by a terrorist group on astronomical objects is not covered by any of the articles of the agreements and treaties covered above. The UN won't have any tools to defend itself if such an attack happens. Since there is a gap in the treaties, terrorist groups can carry out and achieve their goals more easily and without worrying about a coordinated international reaction.

The organization needs to try to explain what space terrorism is in order to create a strategy that will work to counter this threat. It has to list the specific activities that are considered acts of terrorism in space. Articles about counterterrorism in space or counterterrorist strategies may be included to the treaty whenever agreement is reached. Furthermore, the UN can assist nations in formulating strategies to thwart acts of terrorism in space that could target them or their satellite systems.[69]

4.2 PREVENTIVE ACTIONS

In an effort to stop space terrorism, ground-based space systems and control centers are being made to have high security and backup plans in case they are subjected to physical or cyberattacks. Thus far, these proactive steps have proven successful in preventing terrorist strikes against assets situated on the ground.

After reaching a consensus on a space counterterrorism policy, decision-makers must examine specific non-military protective measures as well as survivability planning for safeguarding system functions, which necessitates taking the system architecture into account.[70] An examination of the space dependency connection, which includes a vulnerability assessment of the space system, is the initial step in this regard. Three factors form the basis of the space dependency link: 1) The kinds of space systems currently in use; 2) The scope of use of space systems; and 3) Enemy methods to influence system performance.[76]

Next, it's important to assess if terrorist organizations or national forces could be able to affect these standards. This makes it possible to provide survival measures after evaluating a system's components for vulnerabilities. In order to address the vulnerabilities resulting from the space dependency link, survivability and protective measures, as well as emergency plans incorporating a specific institutional setup, must be modified. International cooperation must also be considered.

To mitigate the space dependence connection, military personnel must have emergency response training and be able to use "alternate means of conducting operations which normally include space dependency links."[71]

5.0 MAINTAINING PEACE IN THE OUTER SPACE

It is essential to create a set of international standards that govern space operations and address issues related to space security. The first stage would be to suggest actions aimed at fostering confidence in

[69] (Mehmood & Ahmed, 2021)
[70] Thomson, Allen. op. cit 19-30. [76] (Remuss, 2009)
[71] Caton, Jeffrey. op. cit.

order to persuade space actors to make promises about the development of a space counterterrorism plan.

There would be a number of challenges in creating legally binding regimes, updating existing ones, or creating ones that support the existing international legal framework. It would be counterproductive to combat any space-related terrorist threats in a reactive manner, which is why such advances must be done quickly. Therefore, developing voluntary TCBMs and other nonlegally enforceable procedures would be the best course of action.(Mehmood & Ahmed, 2021)

It is necessary to create a forum where space actors can discuss the creation of broad guidelines that guarantee ethical behavior and openness. These ought to provide access to space technologies intended for peaceful uses while simultaneously addressing issues related to terrorism in space.

Furthermore, it's critical to develop and advance behavioral norms that can help coordinate space operations while also lessening the potential of terrorism in space. To further improve global cooperation, these standards ought to emphasize data exchange for space-based technologies. Building politically supported legislation to protect space security and lessen the likelihood that it will turn into an active theater of conflict will be made possible with this kind of cooperation.

5.1 RECOMMENDATIONS

In order to combat the potential for space terrorism, worldwide collaboration and alliances are the most effective strategy. Rather than pursuing separate initiatives to improve capacities, states and non-state actors ought to work together to create preventative and defensive measures. Resources allocated and policy decisions made will differ from state to state due to variations in the danger assessment and the urgency of addressing the issue. In this context, the United Nations is essential. Not only can the organization facilitate policy choices, but it may also persuade states to provide the necessary time by implementing measures aimed at fostering confidence.

Because of the space industry's enormous symbolic value, potential for extensive international media attention, and potential for significant economic harm, terrorists find it to be an extremely appealing target. As a result, all parties concerned (such as legislators, law enforcement, and employees of the space industry) should be aware of this fact and take appropriate action and provide resources to combat crimes related to terrorism.

5.2 CONCLUSION

The paper's goal was to present the idea of space terrorism as a fresh avenue or possibility for extraterrestrial attacks. Even though some people find the idea of terrorism in space absurd, it is imperative to address the issue before it becomes an overwhelming menace. It is concerning that space terrorism is not receiving enough attention. As of right now, no nation has taken steps to strengthen its defenses against this kind of danger. It is still possible for state actors to work together to advance space security, nevertheless.

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