## THE LEGALITY OF SAFETY AND SECURITY ZONES IN OUTER SPACE: A LOOK TO OTHER DOMAINS AND PAST PROPOSALS

by

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## Abstract

Recent years have seen the development and use of highly maneuverable satellites capable of conducting autonomous rendezvous and proximity operations in low-earth and geosynchronous orbits. Accompanying this technology is an emerging security threat fostered by unannounced and uncoordinated close approaches. In response to this security threat and a host of other inherently dual-use outer space activities, this thesis considers the legality of unilaterally declared safety and security zones around critical space objects in outer space. First, the work analyzes the interaction between a Russian military satellite and an Intelsat commercial satellite as an example of the emerging threat. It then examines Cold War era proposals for the creation of outer space zones as a part of the United States Strategic Defense Initiative and similar proposals by Soviet writers. While zones were not implemented before the end of the Cold War, insight is gained from the arguments made for and against the proposals in a time of heightened security. The thesis then turns to the sea, air, and cyber domains to analyze various forms of zone constructs that serve a role in preserving safety and security on the high seas and adjoining international airspace. Through this analysis three common principles are identified for international acceptance of safety and security zones: (1) transparency in creating and maintaining a zone; (2) establishment of a zone does not grant sovereign rights; and (3) the law that applies outside a zone, also applies inside the zone. An examination of these norms under the international space law regime show that if a State follows the principles underlying zones in other domains, safety and security zones are lawful in outer space.

## Résumé

Ces dernières années ont connu le développement et l'utilisation de satellites hautement manœuvrables capables d'entreprendre des opérations autonomes de rendez-vous et de proximité en orbites terrestre basse et géosynchrone. Cette technologie a entrainé l'émergence d'une menace pour la sécurité découlant d'approches étroites imprévues et non coordonnées. En réponse à cette menace et à d'autres activités spatiales dont le double usage est inhérent, la présente thèse analyse la légalité de zones unilatéralement déclarées de protection et de sécurité autour d'objets spatiaux critiques. Premièrement, ce travail illustre la menace émergente à travers l'analyse de l'interaction entre un satellite militaire Russe et un satellite commercial Intelsat. Ensuite, il examine les propositions faites durant la Guerre Froide de création de zones spatiales en tant que partie intégrante de l'Initiative de Défense Stratégique des États-Unis, et les propositions similaires faites par des écrivains de l'Union Soviétique. Bien que ces zones n'aient pas été mises en œuvre avant la fin de la Guerre Froide, les arguments avancés en faveur et contre les propositions faites en cette époque de sécurité accrue éclairent notre problématique. Cette thèse se tourne ensuite vers la mer, l'air et les domaines du cyber afin d'analyser différents types de zones jouant un rôle dans la protection et la sécurité en haute mer ainsi que de l'espace aérien international adjacent. Au travers de cette étude, trois principes communs sont identifiés pour l'acceptation internationale de zones de protection et de sécurité : (1) la transparence dans le cadre de la création et du maintien de ces zones; (2) la création d'une zone n'accorde pas de droits souverains; et (3) le droit qui s'applique en dehors de la zone s'applique également à l'intérieur de la zone. Une analyse de ces normes sous le régime du droit international spatial montre que si un État suit les principes qui sous-tendent les zones légales dans d'autres domaines, les zones de protection et de sécurité sont légales dans l'espace.

# Acronyms and Abbreviations

Active Debris Removal
Air Defense Identification Zone
USAF Space Command
Australian Maritime Identification System
Anti-satellite Weapon
Commission on Integrated Long-Term Defense Strategy
UN Committee on the Peaceful Uses of Outer Space
Department of Defense
Exclusive Economic Zone
East China Sea Air Defense Identification Zone
Federal Aviation Authority
Geostationary Orbit
Geosynchronous Orbits
GSO Space Situational Awareness Program
International Academy of Astronautics
International Institute of Humanitarian Law
International Civil Aviation Organization
International Court of Justice
International Space Station
International Telecommunication Union
Joint Space Operations Center
Low-Earth Orbit
Master International Frequency Register
National Aeronautics and Space Administration
Notice to Airmen
Notice to Mariners
Rendezvous and Proximity Operations
Office of Technology Assessment
On-orbit Servicing
Strategic Defense Initiative
Self-Defense Zone
Secretary of Defense
Space Situational Awareness
Space Traffic Management
Transparency and Confidence Building Measures
United Kingdom

UN	United Nations
UNCLOS	UN Convention on the Law of the Sea
US	United States
USAF	US Air Force
USSR	Soviet Union
USSTRATCOM	US Strategic Command

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## INTRODUCTION

In 1983, the Cold War was ongoing and President Ronald Reagan announced the Strategic Defense Initiative (SDI) as a program to deter and if needed, repel a Soviet Union (USSR) nuclear attack. A central part of the plan was the development and deployment of spacebased assets to intercept incoming nuclear weapons, thus creating a theoretical shield of protection above the United States (US). SDI was dubbed "Star Wars" due to its futuristic and seemingly impossible proposals. Since the US was vesting its security in a space-based program, it studied unilateral and multilateral measures to protect the critical infrastructure. The US knew the USSR possessed co-orbital anti-satellite (ASAT) weapon capabilities along with its ballistic missile programs, so it explored military and diplomatic measures to thwart a preemptive Soviet attack on the SDI system.<sup>1</sup> One proposal was the creation of exclusion zones around critical space assets and missions. The proposed zones were subject to government study, but ultimately never exposed to thorough legal analysis due to the abrupt conclusion of the Cold War and eventual end of the SDI program.

Fast forward thirty years and the world is a much different place. The USSR has disbanded. There is no threat of nuclear war, notwithstanding veiled threats by rogue States. Today, the greater concerns among the military powers are "mishaps, misperceptions, and miscalculations."<sup>2</sup> These concerns are increasingly present in outer space where small and highly maneuverable satellites capable of conducting autonomous rendezvous and proximity operations (RPO) have now reached the critical geosynchronous orbits (GSO). Satellites capable of conducting advanced RPO offer great promise for the future sustainability of outer space, but their inherent dual-use capability generate fears of co-orbital ASATs and other nefarious behavior. Ultimately, no State would benefit from a confrontation in outer space. Accordingly, international organizations and governments have devoted considerable effort to reducing the risk of a confrontation in space through proposed codes of conduct, arms control agreements, increased situational awareness, Transparency and Confidence Building Measures (TCBM), and

<sup>&</sup>lt;sup>1</sup> Matthew Mowthorpe, *The Militarization and Weaponization of Space* (Lanham, MD: Lexington Books, 2004) at 18-22.

<sup>&</sup>lt;sup>2</sup> UNC4OR, 67th GA, 9th Mtg, UN Doc GA/SPD/511 (18 October 2012) (Responding to a call to "eliminate the security threat[s]" and other uncertainties in outer space by the Chinese delegation, the US announced it was eager to mitigate the "risk of mishaps, misperceptions, and miscalculations" through TCBM.

space traffic management (STM) systems. Integral to all of these approaches is consensus at the outset, and as a result, progress been measured.

Recognizing that recent attempts at garnering international consensus have not succeeded, this work takes a different approach. The contention is that the permissive nature of international space law allows a State to unilaterally declare safety and security zones around its space objects. Using a recent interaction in GSO between a Russian military satellite and two American-based commercial satellites as a starting point, this paper examines prior outer space zone proposals along with a survey of varying types of zones used in other domains. Through this process, norms of behavior are identified that support or detract from the lawfulness of a proposed zone. There is no specific zone construct guiding this work, nor is there a recommended "model" zone. This work concludes that safety and security zones are lawful when established and maintained in accordance with identified norms.

The purpose of this work is not to advocate for unilateral action in outer space that challenges the status quo. Instead, three overarching principles must be present for safety and security zones to be lawful. First, the creation and operation of the zone must be transparent. Second, the State does not acquire and cannot assert sovereignty over the zone. Finally, the law that applies to the State outside of the zone applies inside the zone as well. In the end, safety and security zones in the abstract are lawful in outer space; however, it remains unclear if they are technically feasible, serve a national interest, or have a role in maintaining space security.

# CHAPTER I The Emergence of Autonomous Rendezvous and Proximity Operations: Reconsideration of Safety and Security Zones in Outer Space

The objective of the first chapter is to show that the development and operability of RPO<sup>3</sup> in outer space<sup>4</sup> present security concerns, not unlike those faced near the end of the Cold War, that may be mitigated by the establishment of safety and security zones in outer space. Before considering the legal implications of unilaterally declared safety and security zones in outer space, it is essential to understand the dual-use capability of satellites and the inherent threat that exists with highly maneuverable, small satellites capable of conducting RPO. The threat posed by these types of satellites is not unlike the threat of co-orbital ASATs experienced during the Cold War, thus the first chapter will conclude with a review of zones that were proposed for the space environment during the Cold War.

# A. Why Consider the Security Implications of RPO Now? The Case of the Luch and Intelsat Satellites<sup>5</sup>

As a starting point and to properly contextualize the security issues at hand regarding RPO, the first chapter will examine the interaction of a Russian state-owned Luch satellite with two privately-owned Intelsat satellites in GSO in late 2015 (Luch-Intelsat Interaction). The review of the Luch-Intelsat Interaction exposes the security and safety concerns RPO presents in the space environment and provides an example of the difficulties presented by uncoordinated and non-transparent RPO activities. The purpose of this review is not to highlight Russian behavior, nor to couch this thesis as a critique of Russian action. Several States, including the

<sup>&</sup>lt;sup>3</sup> RPO is described as "specific processes where two resident space objects are intentionally brought operationally close together." US, Department of Defense, *Space Operations*, Joint Publication 3-14 (29 May 2013) at II-7.

<sup>&</sup>lt;sup>4</sup> In 2006, the *IAA Cosmic Study on Space Traffic Management* concluded that autonomous robotic missions or RPO "will grow, if commercial applications, in particular for satellites on the [GEO] become feasible." Corinne Contant-Jorgenson, Peter Lala, & Kai-Uwe Schrogl, eds, *Cosmic Study on Space Traffic Management* (Paris, France: International Academy of Astronautics (IAA), 2006) at 30.

<sup>&</sup>lt;sup>5</sup> All information in Section A regarding the Luch-Intelsat Interaction, not separately cited, is sourced from the work, "Dancing in the Dark Redux: Recent Russian Rendezvous and Proximity Operations in Space." Brian Weeden, "Dancing in the dark redux: Recent Russian Rendezvous and Proximity Operations in Space" (5 October 2015) *The Space Review*, online: <</p>

US, are developing and testing RPO technologies, thus the roles in the Luch-Intelsat Interaction could be reversed.

Between 25 June 2015 and 25 September 2015, Russia displayed unprecedented behavior by operating a suspected military satellite, named Luch, in close proximity to two privately-owned Intelsat<sup>6</sup> satellites in GSO.<sup>7</sup> This activity was curious, because there were no Russian satellites in the vicinity<sup>8</sup> and Luch moved within five to ten kilometers of one of the Intelsat satellites.<sup>9</sup> A spokesperson for the US Department of Defense (DoD) confirmed that Joint Functional Component Command-Space (JFCC-Space)<sup>10</sup> and representatives of Intelsat contacted Russia. The contact consisted of "emergency close approach notifications..., based on predictions of a close approach with another space object of 5km (three miles) or less within 72 hours."<sup>11</sup> Russia did not respond to the notifications.<sup>12</sup>

This behavior was preceded by three Russian RPO activities in 2014 and early 2015 that caused concern within the US government that Russia may be preparing to use RPO in an adversarial manner. The 2014 and early 2015 actions demonstrated Russia's ability to maneuver small satellites in close proximity and "bump" rocket stage bodies in the low-earth orbit (LEO). These launches were tracked, as are all rocket launches, by analysts at the US Strategic Command's (USSTRATCOM) Joint Space Operations Center (JSpOC)<sup>13</sup> and were believed to

<sup>&</sup>lt;sup>6</sup> Intelsat is a commercial communications satellite company with headquarters in Luxembourg and the US. One of its primary customers for communications services is the US military. Intelsat was initially a public-private organization created by international convention in 1964. By 2001, it had approximately 150 member countries and provided world-wide coverage for broadcasting and communication. In 2001, Intelsat was privatized. Encyclopedia Britannica Online, "Intelsat" (Accessed on 25 May 2016), online: <www.britannica.com/topic/Intelsat>.

<sup>&</sup>lt;sup>7</sup> Mike Gruss, "Fresh Eyes", SpaceNews Magazine (23 May 2016) (Interview of Admiral Cecil D Haney,

Commander of USSTRATCOM), online: <www.spacenewsmag.com/feature/fresh-eyes/>.

<sup>&</sup>lt;sup>8</sup> Intelsat 7 at 18.2 degrees west and Intelsat 901 at 18 degrees west.

<sup>&</sup>lt;sup>9</sup> Chris Zappone, "Luch/Olymp rogue Russian satellite symbolises new worries about space peace", *The Sydney Morning Herald* (24 November 2015), online: <www.smh.com.au/technology/sci-tech/lucholymp-rogue-russiansatellite-symbolises-new-worries-about-space-peace-20151122-gl59of.html>; Spokesperson for JFCC-Space wrote in an email to the *SpaceNews* that Luch moved within five kilometers of another satellite on three occasions, although the particular satellite was not identified. Mike Gruss, "Russian Satellite Maneuvers, Silence Worry Intelsat", *SpaceNews* (9 October 2015), online: <http://spacenews.com/russian-satellite-maneuvers-silence-worryintelsat/> [Gruss, "Russian Silence"].

<sup>&</sup>lt;sup>10</sup> For further discussion of JFCC-Space, see *infra* note 13.

<sup>&</sup>lt;sup>11</sup> Laurence Peter, "Russia Shrugs off US anxiety over military satellite", *BBC News* (20 October 2015), online: <a href="https://www.bbc.com/news/world-europe-34581">www.bbc.com/news/world-europe-34581</a>>.

<sup>&</sup>lt;sup>12</sup> Ibid.

<sup>&</sup>lt;sup>13</sup> JSpOC, located at Vandenberg Air Force Base, California, is one of three operations centers that comprise JFCC-Space. JFCC-Space is a component of USSTRATCOM. JSpOC has tracked over 39,000 man-made objects since the launch of Sputnik I in 1957. It currently tracks 16,000 man-made space objects and provides conjunction warnings for all active spacecraft. Of the 16,000 tracked space objects, 5% are active satellites, 8% are rocket bodies, and 87%

be military satellites. The JSpOC was particularly challenged by these Russian activities, because it initially identified the small satellites on each launch as debris and assigned each one the generic label, "Object E." It was not until the satellites began to conduct RPO and emit S-band signals that the JSpOC identified the three "Object Es" as operational satellites.

Russia's RPO activities in GSO, with their intentions never confirmed, are an example of the confusion and misunderstanding that can result when States exercise their rights of freedom of exploration and use in outer space, as guaranteed in Article I of the 1967 *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies* (Outer Space Treaty),<sup>14</sup> in a manner that poses a security and safety risk to another State's space object. Since Russia never confirmed the purpose of their close proximity operation, observers are left to speculate. Without evidence to the contrary, the assumption is Russia was conducting normal military RPO activities such as intelligence gathering, surveillance, reconnaissance, or carrying out a test of the satellite's systems.<sup>15</sup> The resulting difficulty is the possibility of the same technology and capabilities being used as an ASAT without prior warning. Even if Russia's RPO activities were not intended to be hostile, the encounter can serve as a test of future ASAT capabilities.<sup>16</sup>

While there has been no official response by the US government to the Luch-Intelsat Interaction, it has been reported that Luch's behavior was the subject of classified briefings at the Pentagon and before members of Congress.<sup>17</sup> The incident also appears to be of continued interest to senior military officials as evidenced by comments made by Admiral Cecil D. Haney,

are debris and inactive satellites. US Strategic Command, "Joint Functional Component Command for Space (JFCC Space)" (December 2011), online: USSTRATCOM Factsheets <www.stratcom.mil/factsheets/7/JFCC\_Space/>. <sup>14</sup> Article I, in pertinent part provides:

Outer space, including the Moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies.

Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 27 January 1967, 19 UST 2410, 610 UNTS 205 (entered into force on 10 October 1967) [Outer Space Treaty].

<sup>&</sup>lt;sup>15</sup> Phlip A. Meek, "Strategic (Military) Implications of Active Debris Removal (ADR) and On-Orbit Satellite Servicing (OOS)", Lecture Notes (Visiting Lecturer, Institute of Air & Space Law, McGill University), 11 November 2011) at 10, online: <a href="https://www.mcgill.ca/iasl/files/iasl/sdc2011\_32\_meek.pdf">https://www.mcgill.ca/iasl/files/iasl/sdc2011\_32\_meek.pdf</a> (providing a list of typical military activities in outer space).

<sup>&</sup>lt;sup>16</sup> *Ibid*.

<sup>&</sup>lt;sup>17</sup> Gruss, "Russian Silence", *supra* note 9.

Commander USSTRATCOM, several months after the Luch-Intelsat Interaction.<sup>18</sup> While speaking at the 32nd Space Symposium,<sup>19</sup> Admiral Haney stated that the US needs to better understand its adversaries so it can "deny enemy action, hold critical nodes at risk and prevent perceptions, misperceptions and actions from escalating." Later in the speech, he reminded the audience of the Russian "Object E" and how it was initially thought to be debris, but began acting in a "non-debris fashion." He warned the audience to expect more of this type of behavior.<sup>20</sup>

The use of autonomous RPO in GSO is not unique to Russia and this fact likely played a role in the US not publicly condemning the Luch behaviors. Prior to the Luch-Intelsat interaction, the US Air Force (USAF) announced it had launched two satellites into GSO as a part of the GSO Space Situational Awareness (SSA) Program (GSSAP). These satellites move through a near-geostationary (GEO) orbit<sup>21</sup> for the purpose of viewing other satellites.<sup>22</sup> In an interview with the news program, *60 Minutes*, General John Hyten, Commander of USAF Space Command (AFSPC), described the importance of GEO to the US and the lengths the US would take to secure its assets. His primary message regarding GEO was:

We want people to understand that we're watching. There will be no surprises in GEO. And we want everybody in the world to know that there will be no surprises in that orbit. It's way too valuable for us to just be surprised....Deterrence in the space world... [is] the ability to convince the adversary that if they attack us, they will fail.<sup>23</sup>

The US is not only concerned with Russian capabilities, as it also estimates that in 2014 China possessed the fastest developing space program in the world and its space assets underpin its

<sup>&</sup>lt;sup>18</sup> Speech by Admiral Cecil D. Haney, USSTRATCOM Commander, (32nd Space Symposium, Colorado Springs, CO, 14 April 2016) [unpublished], online:

<sup>&</sup>lt;a href="https://www.stratcom.mil/speeches/2016/169/32nd\_Space\_Symposium/printable">https://www.stratcom.mil/speeches/2016/169/32nd\_Space\_Symposium/printable</a>>.

<sup>&</sup>lt;sup>19</sup> The annual Space Symposium is attended by leaders from all sectors and heralds itself as the "premier U.S. space policy and program forum." 32nd Space Symposium, online: <www.spacesymposium.org/about/space-symposium>.

<sup>&</sup>lt;sup>20</sup> Haney, *supra* note 18.

 <sup>&</sup>lt;sup>21</sup> The satellites' missions are described as "space surveillance" and are located at approximately 22,300 miles (35,970 km) above Earth's surface. US Air Force, "Geosynchronous (GEO) Space Situational Awareness (SSA) Program (GSSAP)", Fact Sheet (Current as of April 2015) online: <www.afspc.af.mil/About-Us/Fact-Sheets/Article/730802/geosynchronous-space-situational-awareness-program-gssap>.
 <sup>22</sup> *Ihid*

<sup>&</sup>lt;sup>23</sup> Interview of General John Hyten, USAF, Commander AFPSC, by David Martin (26 April 2015) on *60 Minutes*, *CBS News*, transcript available online: <www.spacenews.com/transcript-of-60-minutes-air-force-space-command-segment/> ["Hyten Interview"].

"national civil, economic, political, and military goals and objectives."<sup>24</sup> Of particular concern to the present issue is China's demonstration of "increasingly complex close proximity operations between satellites while offering little in the way of transparency or explanation."<sup>25</sup>

Along with the US government, Intelsat was concerned about the close, uncoordinated operations of the Luch satellite. Kay Sears, President of Intelsat General, the government services arm of Intelsat, put the situation bluntly, "This is not normal behavior and we're concerned...We absolutely need responsible operators." Although alarmed by the Russian behavior, Ms. Sears noted the Russian satellite did not interfere with Intelsat satellite services.<sup>26</sup> She did say however that she believed the "'safety of flight' of the Intelsat satellites was at risk."<sup>27</sup> She continued, "They're not collaborating with us. The 'safety of flight' that's so important to operators is being put at risk and that's concerning. That's just irresponsible. If we all did that, we would have a lot of accidents."<sup>28</sup>

Although Russian satellite operators were unresponsive to calls for coordination by the US and Intelsat, the lead scientist at the Russian-based Institute of Space Policy, Ivan Moiseyev, did discuss the activity after Luch had maneuvered away from the Intelsat satellites. He acknowledged the US concern about the Luch satellite movements; however, he stated "the possibility of a collision or some kind of interference is extremely small."<sup>29</sup> He further stated, "There were no violations in this case" and the Luch "is simply a relay satellite, sending signals from spacecraft to Earth, for example from the ISS – we have communications problems there – and from one satellite to another." He continued, "In no way can it be an 'aggressor', any satellite can make some clumsy manoeuvers – but collisions are extremely rare."<sup>30</sup> In fact, Mr. Moiseyev is correct in saying that there were no violations in this case. The lack of a "rules of

<sup>25</sup> US, Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2012* (Washington, DC: US Government Printing Office, 2012) at 9, online: <www.defense.gov/Portals/1/Documents/pubs/2012\_CMPR\_Final.pdf>. China demonstrated its ability to conduct RPO in 2010 when a newly launched satellite rendezvoused with an older Chinese satellite in LEO. China never publicly discussed the activity or its purpose. Brian Weeden, "Dancing in the Dark: The Orbital Rendezvous of SJ-12 and SJ-06F", *The Space Review* (30 August 2010), online: <www.thespacereview.com/article/1689/1>. <sup>26</sup> Gruss, "Russian Silence", *supra* note 9.

<sup>&</sup>lt;sup>24</sup> US, Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2015* (Washington, DC: US Government Printing Office, 2015) at 13, online: <<a href="https://www.defense.gov/Portals/1/Documents/pubs/2015\_China\_Military\_Power\_Report.pdf">www.defense.gov/Portals/1/Documents/pubs/2015\_China\_Military\_Power\_Report.pdf</a>>.

<sup>&</sup>lt;sup>27</sup> Ibid.

<sup>&</sup>lt;sup>28</sup> Ibid.

<sup>&</sup>lt;sup>29</sup> Peter, *supra* note 11.

<sup>&</sup>lt;sup>30</sup> Ibid.

the road" regime in outer space results in States only being responsible to show "due regard" to the corresponding interests of others.<sup>31</sup>

As stated earlier, the purpose of reviewing the Luch-Intelsat Interaction and other Russian satellite operations in the beginning of this thesis is not to highlight potentially dangerous behavior by Russia, but it does appear to be the first publicly documented close encounter between a commercial satellite and a foreign military satellite.<sup>32</sup> Rather it is to demonstrate that as satellite movements become more sophisticated, more routine, and interactions between satellites from different States increase, the potential for miscalculations and avoidable collisions will rise. Each uncoordinated interaction has the potential to serve as the spark that ignites the long dreaded "space war."<sup>33</sup> The Luch-Intelsat case did not cause such a spark, but represents how States are likely to interact in the future. Instead of calling for the apparent need for a robust, agreed upon STM system,<sup>34</sup> this thesis will examine the lawfulness of one response States may take in securing their space assets – the establishment of safety and security zones around critical space objects.

#### B. The Development of Autonomous RPO

Before looking at RPO in the context of space security<sup>35</sup> and the lawfulness of safety and security zones, it is important to understand what is meant when an activity is described as RPO. A rendezvous operation is the intentional movement of two space objects close together, while a proximity operation consists of "on-orbit operations that deliberately and necessarily place and

<sup>&</sup>lt;sup>31</sup> Outer Space Treaty, supra note 14, art 9.

<sup>&</sup>lt;sup>32</sup> Gruss, "Russian Silence", *supra* note 9. Although an interesting question and subject of further study, this thesis will not explore or consider the options available to commercial space operators when they believe close encounters endanger safety of flight and the other operator does not respond to calls for coordination.

<sup>&</sup>lt;sup>33</sup> During an interview with the *CBS news program 60 Minutes*, General Hyten, opined that if the US lost access to outer space, we would revert to industrial age warfare that last experienced in World War II. Regarding the potential of a conflict in space, General Hyten said, "It's a competition that I wish wasn't occurring, but it is. And if we're threatened in space, we have the right of self-defense, and we'll make sure we can execute that right." "Hyten Interview", *supra* note 23.

<sup>&</sup>lt;sup>34</sup> See Contant-Jorgenson, *supra* note 4. (This study determined that an internationally binding STM system will only be realized when "States identify a certain urgency and expect a specific as well as collective benefit from this," while acknowledging that a STM system will limit the freedom of use of outer space.); In President Barack Obama's 2008 presidential campaign's space policy, he revealed that he would negotiate and work with other nations to develop "rules of the road" for outer space. Barack Obama 2008, Policy Statement, "Barack Obama: Advancing the Frontiers of Space Exploration" (16 August 2008), online:

<sup>&</sup>lt;www.spaceref.com/news/viewsr.html?pid=28880>. One author has opined that simply placing STM on the agenda of the COPUOS would be a "political miracle" and likely impossible in our lifetimes. José Monserrat Filho, "Space Traffic Management: Comparative Institutional Aspects" (2002) 45 Proc on L Outer Sp 487 at 492.

<sup>&</sup>lt;sup>35</sup> See Part III-B, *below*, for more on space security.

maintain a space object within a close distance of another space object for some specific purpose."<sup>36</sup> Current and future space activities such as On-orbit Servicing (OOS) and Active Debris Removal (ADR) are two RPO technologies that will serve to sustain the space environment by reducing the production rate of space debris and removing existing debris from orbit.<sup>37</sup> Similarly, co-orbital ASATs are also RPO activities. This inherent dual-use capability is a source of both space security concerns and difficult legal questions related to RPO.<sup>38</sup>

RPO is not new to outer space; however, the emergence of autonomous<sup>39</sup> RPO which are capable of operating above the human flight zone is a relatively recent phenomena and present challenges to SSA that are not presented by manned RPO.<sup>40</sup> As early as 1965, the National Aeronautics and Space Administration (NASA) demonstrated the ability to rendezvous the Gemini VI and Gemini VII spacecraft.<sup>41</sup> The experience gained in the Gemini rendezvous activity provided the groundwork for the eventual Apollo lunar landing missions.<sup>42</sup> As spaceflight advanced, so did RPO as shown by the fifty-seven Space Shuttle missions that conducted at least one RPO objective.<sup>43</sup> Throughout the history of spaceflight, a common characteristic of RPO is the direct human control of one of the participating spacecraft. Whether

 <sup>&</sup>lt;sup>36</sup> US Air Force, *AU-18 Space Primer*, 2 ed (Air University Press: Maxwell Air Force Base, Alabama, 2009) at 142 [AU-18 Space Primer], online: 
 <sup>37</sup> Throughout this thesis both rendezvous and proximity activities will be discussed together and unless specifically

<sup>&</sup>lt;sup>37</sup> Throughout this thesis both rendezvous and proximity activities will be discussed together and unless specifically noted, it can be assumed that any analysis applies to both.

<sup>&</sup>lt;sup>38</sup> "[T]he majority of those devices involved in military uses of outer space have a dual purpose not only in the sense that they are both offensive and defensive, but also because they carry out both civilian/commercial activities as well as military ones. This concept of a dual use satellite is by now well-known in space parlance, giving rise to further difficult legal issues." Jackson N. Maogoto & Steven Freeland, "Space Weaponization and the UN Charter Regime on Force: A Thick Legal Fog or a Receding Mist?" (2007) 41 Intl L 1091 at 1100.

<sup>&</sup>lt;sup>39</sup> The term "autonomous" in this context will be used to describe both fully autonomous activities and those sometimes described as "semi-autonomous." Timothy Carrico, et al, "Proximity Operations for Space Situational Awareness: Spacecraft Closed-Loop Maneuvering Using Numerical Simulations and Fuzzy Logic" (Paper delivered at the Advanced Maui Optical and Space Surveillance Technologies Conference, September 2006) at 1, online: <<www.centerforspace.com/downloads/files/pubs/AMOS-2006.pdf> ("The advances in onboard processing and high-speed communication links are enabling a new generation of semi-autonomous and fully autonomous spacecraft that are capable of operating in close proximity to other spacecraft." at 1).
<sup>40</sup> See generally, Brian Weeden, et al, "International Perspectives on On-orbit Satellite Servicing and Active Debris

<sup>&</sup>lt;sup>40</sup> See generally, Brian Weeden, et al, "International Perspectives on On-orbit Satellite Servicing and Active Debris Removal and Recommendations for a Sustainable Path Forward" (Paper delivered at the 64th International Astronautical Congress, Beijing, China, 23 September 2013) at 2, [unpublished], online: <<u>https://iafastro.directory/iac/archive/browse/IAC-13/E3/4/16786/></u>.

<sup>&</sup>lt;sup>41</sup> Abraham Franz Banner, "Spacecraft Proximity Operations Used to Estimate the Dynamic & Physical Properties of a Resident Space Object" (Masters Aerospace Engineering, Air University, 2007) [unpublished] at 2, online: <a href="https://www.dtic.mil/dtic/tr/fulltext/u2/a469281.pdf">www.dtic.mil/dtic/tr/fulltext/u2/a469281.pdf</a>>.

<sup>&</sup>lt;sup>42</sup> Roger E. Bilstein, *Flight in America: From the Wrights to the Astronauts*, 3rd ed (Baltimore: John Hopkins University Press, 2001) at 275.

<sup>&</sup>lt;sup>43</sup> John L. Goodman, "History of Space Shuttle Rendezvous and Proximity Operations" (2006) 43:5 J Spacecraft & Rockets 944.

it be in-flight maneuvering by an on-board crew or remote control by ground personnel, the final stage of the mission had remained a human function.<sup>44</sup> The need for human control has required space objects capable of conducting RPO to be relatively large and slow moving, such as the Space Shuttle.

The level of human control required for RPO has decreased over time, and now autonomous RPO is conducted by relatively small satellites that perform highly complex maneuvers. Autonomous RPO has now been demonstrated in LEO<sup>45</sup> and GSO,<sup>46</sup> thus the most critical satellites are now in reach for both peaceful and non-peaceful RPO applications.

#### 1. On-Orbit Servicing

The first RPO capability to be considered is OOS, which at its basic level is the rescue, refueling, repositioning, repair, or inspection of space objects in orbit.<sup>47</sup> OOS has been successfully performed during manned space missions on several occasions, including servicing of the Hubble Space Telescope and the ISS, but the commercial viability and ability to be accomplished autonomously in GSO is a recent development.<sup>48</sup> Because of the inherent dual capability and need for transparency in conducting OOS, this new phase will only be accomplished if the national security, civil and commercial sectors work together.<sup>49</sup>

The collaboration between the various sectors is feasible, because "the significant costs associated with building and launching replacement satellites have spurred both the US government and private industry to explore alternate means to prolong a satellite's life."<sup>50</sup> A national security initiative announced in 2016 is the Defense Advanced Research Projects

<sup>&</sup>lt;sup>44</sup> Banner, *supra* note 41 at 3.

<sup>&</sup>lt;sup>45</sup> LEO starts at the edge of Earth's atmosphere at about 60 miles up and reaches approximately 1,200 miles above the Earth. This is the easiest orbit to reach with a space object and is home to over half of the approximately 1,050 operational satellites and the ISS." James Clay Moltz, *Crowded Orbits: Conflict and Cooperation in Space*, (New York: Columbia University, 2014) at 20-22.

<sup>&</sup>lt;sup>46</sup> GSO as used in this work reflects all geosynchronous and geostationary orbits. USAF, *Space Operations, AF Doctrine Document 3-14* (19 June 2012) at 67. GEO is a unique orbit that is 22,300 miles above earth, where satellites appear stationary because they move at the same speed as the Earth's rotation, and is home to nearly half of the approximately 1,050 operational satellites. Moltz, supra note 45.

<sup>&</sup>lt;sup>47</sup> NASA Goddard Space Flight Center, "On-Orbit Satellite Servicing Study Project Report 119" (October 2010), online: <a href="http://ssco.gsfc.nasa.gov/images/NASA">http://ssco.gsfc.nasa.gov/images/NASA</a> Satellite%20Servicing Project Report 0511.pdf>.

<sup>&</sup>lt;sup>48</sup> US Congress, *Commercial Space: Hearing Before the Subcommittee On Space, Committee on Science, Space, and Technology, House of Representatives*, 113th Cong (20 November 2013) at 20 (Written answers to Post-Hearing Questions by Patricia A. Cooper, Pres., Satellite Industry Association) [*Commercial Space Hearing*].

<sup>&</sup>lt;sup>49</sup> John Goehring, "Public-Private Partnerships and On-Orbit Satellite Servicing: Select Legal Issues" (2015) [unpublished, article on file with the author] at 4.

<sup>&</sup>lt;sup>50</sup> *Commercial Space Hearing, supra* note 48.

Agency's (DARPA) Robotic Servicing of GEO Satellites (RSGS) program, which envisions, "a DARPA-developed modular toolkit…joined to a privately developed spacecraft to create a commercially owned and operated robotic servicing vehicle that could make house calls in space."<sup>51</sup> RSGS hopes to provide the anticipated service available to both military and commercial GEO satellite operators.<sup>52</sup> In the commercial sector, one company plans to launch a space object that extends the life of another satellite by attaching itself to the target satellite and performing the maneuvering and station keeping functions for the host satellite.<sup>53</sup> For the civil sector, NASA announced its Restore-L mission in 2016 with a launch in 2019. Restore-L will rendezvous with, grasp, refuel, and relocate a US government satellite in LEO.<sup>54</sup> The ultimate goal of OOS is to restore satellites to their original capacity and decrease the creation of space debris.

#### 2. Active Debris Removal

While OOS will facilitate a decrease in the creation of space debris by sustaining operational satellites, space debris is created at a higher rate than the natural decaying process is able to remove debris from orbit. Some studies have concluded that even with no further human actions, *collision cascading* could substantially increase the hazards of operating in space.<sup>55</sup> As a result, governments and commercial operators are developing remediation technologies. One such technology is ADR which physically removes debris from orbit.

This technology is seen as critical to the future of the space environment. The European Space Agency estimates that there are over 170 million pieces of space debris larger than one millimeter, 670,000 larger than 1 centimeter, and 29,000 larger than 10 centimeters.<sup>56</sup> Debris pieces as small as 1 millimeter could destroy sub-systems on a space object, while a 10

<sup>&</sup>lt;sup>51</sup> US, Defense Advanced Research Projects Agency, "Program Aims to Facilitate Robotic Servicing of Geosynchronous Satellites", (15 Mar 2016), online: <www.darpa.mil/news-events/2016-03-25>.
<sup>52</sup> Ibid.

<sup>&</sup>lt;sup>53</sup> Jeff Foust, "Orbital ATK signs Intelsat as first satellite servicing customer", *SPACENEWS* (12 April 2016) <<u>http://spacenews.com/orbital-atk-signs-intelsat-as-first-satellite-servicing-customer></u>.

<sup>&</sup>lt;sup>54</sup> US, NASA, "Restore-L Fact Sheet", online:

<sup>&</sup>lt;http://ssco.gsfc.nasa.gov/images/Restore\_L\_Factsheet\_030916\_02.pdf>.

<sup>&</sup>lt;sup>55</sup> See, J.C. Liou & N.L. Johnson, "Instability of the Present LEO Satellite Populations" (2008) 41:7 Advances in Sp Research 1047 at 1056; J.C. Liou & N.L. Johnson, "A Sensitivity study of the Effectiveness of Active Debris Removal in LEO" (2008) 64:3 Acta Astronautica 236 at 243.

<sup>&</sup>lt;sup>56</sup> European Space Agency, Clean Space One Project, "How Many Space Debris Objects are Currently in Orbit" (Last update 25 July 2013), online:

 $<sup>&</sup>lt; http://m.esa.int/Our_Activities/Space_Engineering_Technology/Clean_Space/How_many_space_debris_objects_a re_currently_in_orbit>.$ 

centimeter object would likely disable a space object and penetrate the ISS shields.<sup>57</sup> Just as with OOS, the technology that will allow ADR to accomplish its mission will also allow it to operate as an ASAT.<sup>58</sup> The challenge for States with national security concerns will be the ability to determine the intent behind missions and not the technological capabilities of the system.

#### 3. Co-Orbital ASATs

Space weapons, that is those weapons based in space or on the ground and intended for space, have been a concern even before Sputnik I was launched in 1957.<sup>59</sup> The US, Russia, and China have demonstrated ASAT capabilities and the willingness to test weapons in space. While the US and China have publicly demonstrated their ability to target an on-orbit satellite with air and ground-based kinetic weapons, the USSR is the only State known to have tested and declared operational co-orbital ASATs.<sup>60</sup> It is believed these weapons became operational in 1971 at altitudes up to 5,000 km.<sup>61</sup> Between 1971 and 1983, the USSR suspended and resumed testing of ASATs on several occasions, although the USSR never officially acknowledged the development and testing of co-orbital ASATs.<sup>62</sup>

The interest in and development of co-orbital ASATs by the USSR and the willingness of China and the US to demonstrate ASAT capability provide insight into the situation faced today.

<sup>&</sup>lt;sup>57</sup> *Ibid*.

<sup>&</sup>lt;sup>58</sup> Ram Jakhu & Yaw Nyampong, "Some Legal and Regulatory Constraints on the Conduct of Active Debris Removal and On-Orbit Satellite Servicing" (Paper delivered at the 63rd Astronautical Congress, Naples Italy, 2012) at 10 [unpublished].

<sup>&</sup>lt;sup>59</sup> USAF, *Counterspace Operations*, Air Force Doctrine Document 2-2.1 (2 August 2004, incorporating through change 1, 28 July 2011) at 33. Antisatellite weapons are defined to "include direct ascent and co-orbital systems that employ various mechanisms to affect or destroy an on-orbit spacecraft." Ibid. One author defines "space weapons and offensive space warfare initiatives as terrestrially-based devices specifically designed and flight tested to physically attack, impair or destroy objects in space, or space-based devices designed and flight tested to attack, impair or destroy objects in space or on Earth." This definition attempts to remove weapons that only "pass" through space on their way to their terrestrial target and does not include military space assets that facilitate military activity, but do not perform as a weapon platform. Michael Krepon & Michael Katz-Hyman, "Space Weapons and Proliferation" in UN Institute for Disarmament Research, Building the Architecture for Sustainable Space Security: Conference Report 30-31 March 2006 (UN Publications, Geneva, 2006) at 40-41 [UN, Sustainable Space Security]. <sup>60</sup> "The USSR tested a co-orbital interceptor which maneuvered across the path of a presumed target satellite and then exploded a few miles beyond." Malcom Russell, "Military Activities in Outer Space: Soviet Legal Views" (1984) 25 Harv Intl LJ 153 at 155. It is believed the co-orbital ASAT is the only dedicated ASAT system developed by Russia. The system would pass through orbit once or twice in order to reach its desired location and then deploy a conventional explosive that would damage the target satellite with shrapnel. Laura Grego, "A History of Anti-Satellite Programs" (January 2012) at 3, online: Union of Concerned Scientists

<sup>&</sup>lt;www.ucsusa.org/sites/default/files/legacy/assets/documents/nwgs/a-history-of-ASAT-programs lo-res.pdf> [Grego, "Anti-satellite Programs"].

<sup>&</sup>lt;sup>61</sup> US Department of Defense, Soviet Military Power, 4th ed (Washington, DC: US Government Printing Office, April 1985) at 56. <sup>62</sup> *Ibid*.

Any satellite that can approach another satellite can be used as a weapon against the target satellite. Because these types of weapons are not sophisticated weapons systems and may not be easily identifiable, inspection of these satellites before or after launch may not provide insight into capabilities or intent.<sup>63</sup>

In recent times, US military commanders have lamented the effects of a space-based attack and it is sometimes portrayed as a new or emerging problem; however, in 1984, the US DoD was keenly aware of the effects an attack on their space assets would have. The Assistant Secretary of Defense for International Security Policy, Richard Perle told the US Congress,

We believe that this Soviet anti-satellite capability is effective against critical US satellites in relatively low orbit, that in wartime we would have to face the possibility indeed the likelihood, that critical assets of the US would be destroyed by Soviet anti-satellite systems.<sup>64</sup>

The concern in the US today regarding the vulnerability of its most critical space assets is a continuation of an assessment that started decades ago. At the time of Mr. Perle's statement there was already concern regarding the USSR's future use of highly maneuverable spacecraft with non-cooperative rendezvous capability as an ASAT.<sup>65</sup>

During the Cold War, a time of increasing concern about the vulnerability of space assets, there was a realization that "rules of the road" were needed for outer space, but the likelihood of such an agreement was dire. As a result, different unilateral measures were considered for securing space assets. One such proposal was "keep-out zones." The idea of declaring regions in space or areas surrounding space objects as off-limits to other States received consideration by the US government due to the fear of nuclear weapons, space mines, and co-orbital ASATs. Some of the same fears that led to the consideration of "keep-out zones" have once again presented themselves along with advancements in technology and an increasing number of space actors.

<sup>&</sup>lt;sup>63</sup> Grego, "Anti-Satellite Programs", *supra* note 60 at 15.

<sup>&</sup>lt;sup>64</sup> US, *Space Defense Matters in Review of the FY 1984*, Defense Authorization Bill: Hearings Before the Subcommittee on Strategic and Theater Nuclear Forces of the Committee on Armed Services US Senate Testimony, 98th Congress (15 March 1984) at 3452 (Richard Perle, Assistant Secretary of Defense, International Security Policy).

<sup>&</sup>lt;sup>65</sup> US Congress, Office of Technology Assessment (OTA), *Anti-Satellite Weapons, Countermeasures, and Arms Control* (OTA – 1.S – 281) (Washington, DC: US Government Printing Office, September 1985) at 55 [*OTA Report*].

#### C. Avoiding Conflict in Space – Role of Safety and Security Zones

While the Luch-Intelsat Interaction did not lead to a catastrophic result, it provides an example of how "uncoordinated intentional or unintentional approaches to space objects of other states may create a danger of military confrontation in outer space." <sup>66</sup> The threat of unintended confrontation in outer space is the overarching concern that drives the consideration of the lawfulness of unilaterally declared safety and security zones in outer space, because a military confrontation in outer space would be catastrophic for future access to outer space by both government and commercial entities.<sup>67</sup>

The role of zones in preventing conflict in space is multifaceted. First, zones address behavior, and not capabilities, of States relative to their space objects, thus the establishment of safety and security zones would not limit the military capabilities of any State. Second, zones would provide an impediment to States who consider using co-orbital ASATs, such as space mines, as they would not be easily placed near other satellites. Lastly, violating a declared zone would highlight suspicious activities to the targeted State, while respecting the zone would serve as a form of restraint.<sup>68</sup>

"There is no prioritization of certain space activities, no 'right-of-way-rules', nor is any kind of utilization of space ruled out (except those against the peaceful uses)."<sup>69</sup> Without international coordination or prioritization of maneuvers in GEO (or other orbits for that matter), collisions and misperceptions are certainly possible, if not increasingly likely. Although satellite operators place intense resources on maneuvering applications, little effort is invested in coordinating those activities with other States that may be impacted or pose a safety risk.<sup>70</sup> The Cosmos-Iridium collision highlights the limits of current SSA and the catastrophic results of an on-orbit collision.<sup>71</sup> This fear of collision is often cited as a reason to pursue an agreed upon STM system and to strengthen SSA. Certainly, a STM system and better SSA would provide the

 <sup>&</sup>lt;sup>66</sup> Paul B. Larsen, "Outer Space Traffic Management: Space Situational Awareness Requires Transparency" (2008)
 51:1 Proc Intl Inst Sp L 338 at 346.

<sup>&</sup>lt;sup>67</sup> Ibid.

<sup>&</sup>lt;sup>68</sup> Michael E. O'Hanlon, "Balancing U.S. Security Interests in Space" in Charles D. Lutes and Peter L. Hays, eds, *Toward a Theory of Space Power: Selected Essays* (Washington, DC: Institute for National Strategic Studies, National Defense University, 2011) at 416.

<sup>&</sup>lt;sup>69</sup> Contant-Jorgenson, *supra* note 4 at 16.

<sup>&</sup>lt;sup>70</sup> Ibid.

<sup>&</sup>lt;sup>71</sup> Becky Iannotta & Tariq Malik, "US Satellite Destroyed in Space Collision", *Space.com* (11 February 2009), online: <www.space.com/5542-satellite-destroyed-space-collision.html>.

best opportunities to avoid unintentional collisions and miscalculations regarding another State's intentions; however, until such cooperation is realized, States will be confronted with fears regarding national security and collisions.<sup>72</sup>

#### 1. Safety and Security Zones in Outer Space – Prior Proposals

Since the beginning of the space age and most notably during the Cold War, there have been studies and calls for the establishment of zones in outer space requiring some level of coordination for the passage of space objects within the established zones.<sup>73</sup> These zones have been described as keep-out zones, caution zones, safety zones, security zones, and self-defense zones. Most zone proposals can be placed in one of two groups. The first group proposes zones be created surrounding critical space assets, while the other group proposes to protect critical space missions by dividing outer space into regions that are fixed relative to Earth and assigned to specific States or groups of States. Both proposals can be described as "an area of space through which the space objects of other nations could not pass without permission."<sup>74</sup>

Two valuable characteristics of safety and security zones are the elimination of ambiguity and the clarification of motive.<sup>75</sup> The success of zones in avoiding collisions and reducing misunderstandings regarding motives would ultimately depend on the lawfulness of such action and the technical means to enforce. This thesis does not attempt to address the technical feasibility of creating or enforcing such zones, because a zone would have different characteristics according to the orbit in which it is established or the space object it is surrounding.<sup>76</sup>

Although safety and security zones have been studied in the past, the concept has never materialized into practice. Just as the fear of space-based weapons and co-orbital ASATs led to consideration of exclusion zones during the Cold War, the advent of highly maneuverable satellites has resurrected the need to consider the usefulness and lawfulness of such zones. Safety

<sup>&</sup>lt;sup>72</sup> Without question, conflict in outer space would erode space security. Space security is generally understood to be "secure and sustainable access to, and use of, outer space and freedom from any threats or unreasonable (unjustified) barriers to such access and use." Ram Jakhu & Karan Singh, "Space Security and Competition for Radio Frequencies and Geostationary Slots" (2009) 58 ZLW 74 at 76 [Jakhu, "Space Security"].

 <sup>&</sup>lt;sup>73</sup> Michael Krepon & Christopher Clary, *Space Assurance or Space Dominance? The Case Against Weaponizing Space* (Washington, DC: Stimson Center, 2003) at 118 [Krepon, *Space Assurance*].
 <sup>74</sup> Richard Dalbello, "Rules of the Road: Legal Measures to Strengthen the Peaceful Uses of Outer Space" (1985) 28

<sup>&</sup>lt;sup>74</sup> Richard Dalbello, "Rules of the Road: Legal Measures to Strengthen the Peaceful Uses of Outer Space" (1985) 28 Proc on L Outer Sp 8 at 9.

<sup>&</sup>lt;sup>75</sup> Krepon, *Space Assurance, supra* note 73 at 118.

<sup>&</sup>lt;sup>76</sup> Ibid.

and security zones have been discussed and studied as both a part of a larger "rules of the road" regime and as unilaterally established.<sup>77</sup> The present analysis will primarily address the lawfulness of unilaterally declared security zones; however, some attention will be given to proposals intended for multilateral STM agreements that include the establishment of zones.

#### 2. U.S. Proposals for Safety and Security Zones

Safety and security zones, if seen as purely defensive in nature, are most appealing to States that focus on the long-term survivability of satellites and thus launch fewer into orbit, such as the US. Likewise, safety and security zones may be less appealing to States that rely on redundancy and launch numerous satellites with a shorter lifespan, such as Russia. For countries that focus on redundancy and less sophistication, resiliency is found in the ability to quickly replace lost satellites with launch capability or systems already in orbit. However, all States would benefit from a reduction in ambiguity and suspicion regarding RPO activity. As such, safety and security zones could play a role in securing the satellites of any State.

The idea of safety and security zones can be found in works considering arms control in outer space and those contemplating STM rules. Zones potentially have a role in arms control, because some argue a ban on weapons in outer space will never be effective due to verification challenges. The rationale supporting such a belief is that there will always be weapons in outer space as long as there are satellites with dual-use capability. Zones, whether a part of a larger STM system or unilaterally declared, would not limit space weapons, but instead limit proximity that satellites may pass by other satellites and thus reduce the probability that such a satellite is capable of attack.

#### a. Keep-Out Zones

In the early 1980's, the US Congress asked the Office of Technology Assessment (OTA) to prepare a report detailing current space technology regarding ASATs and the implications and prospects of armed control agreements.<sup>78</sup> Of all of the differing proposals put forward by OTA to protect US satellites, it concluded keep-out zones would offer the most security if the US were able to defend such zones.<sup>79</sup> In putting this recommendation forward, OTA determined the lack

<sup>&</sup>lt;sup>77</sup> F. Kenneth Schwetjie, "Protecting Space Assets: A Legal Analysis of 'Keep-Out Zones'" (1987) 15:1 J Space L 131 at 132.

<sup>&</sup>lt;sup>78</sup> OTA Report, supra note 65 at 25.

 $<sup>^{79}</sup>$  *Ibid* at 118.

of restrictions on the "development and deployment of ASAT weapons," would likely not change and "satellite survivability can be enhanced if the US is willing to negotiate or unilaterally declare keep-out zones and is able thereafter to defend such zones against unauthorized penetration by foreign spacecraft."<sup>80</sup> During the time of the OTA study, nuclear weapons were of the utmost concern and any proposed zone needed to be sufficiently sized so as to protect against potential nuclear attack from on-orbit threats. Additionally, any proposed zone must have been adequately sized to meet its goal of providing some transparency to the operating State.

The OTA produced a report entitled, Anti-Satellite Weapons, Countermeasures, and Arms Control. The authors of the report described "keep-out zones" as,

A volume around a space asset, off limits to parties not owners of the asset. Keep-out zones could be negotiated or unilaterally declared. The right to defend such a zone by force and the legality of unilaterally declared zones under the Outer Space Treaty remain to be determined <sup>81</sup>

The value of keep-out zones would be most effective against certain ASATs, such as space mines, when combined with active or passive countermeasures, although keep-out zones would likely offer little protection from advanced directed-energy or kinetic energy ASATs.<sup>82</sup>

In order for keep-out zones to be effective against an increased number of ASAT technologies, the size of the zone would need to be increased relative to the threat.<sup>83</sup> In the case of GEO, where many critical satellites are located, the study determined that the number of satellites already in orbit and the number of planned launches would prohibit large zones from being established. Similarly, LEO is also highly congested and only small zones would be feasible, although other limitations on movement could be established, such as minimum angular

<sup>&</sup>lt;sup>80</sup> *Ibid* at 10.

<sup>&</sup>lt;sup>81</sup> *Ibid* at ix. <sup>82</sup> *Ibid* at 10.

<sup>&</sup>lt;sup>83</sup> The standard keep-out zone as described in the OTA report would consist of the following rules:

Keep 100 kilometers and three degrees out-of-plane from foreign satellites below 5,000 km.

Keep 500 km from foreign satellites above 5,000 km except those within 500 km of geosynchronous altitude.

One pre-announced close approach at a time is allowed.

In the event of a violation of the rules above, the nation of registry of the satellite most recently initiated a \_ maneuver "burn" is at fault and guilty of trespass.

Satellites trespassing upon keep-out zones may be forcibly prevented from continued trespass.

These rules recognize the different environments found in different orbits and attempts to craft rules that accommodate the differences. The lawfulness of this type of zone will be the subject of Chapter 3 in this work. *Ibid* at 137.

separation parameters that would inhibit continuous trailing by other satellites. Other orbits, such as supersynchronous, offer sufficient capacity to establish effective keep-out zones if it was determined assets in the particular orbit needed the protection of a zone.<sup>84</sup>

The OTA study found that zones would make it more difficult for space mines to loiter near a satellite and detonate on command and with increased satellite hardening, a sufficiently sized zone could reduce the risk of kinetic attacks.<sup>85</sup> Along the same line, a State may deploy defensive satellites to "guard" the keep-out zone, which would significantly increase the effectiveness of the zone.<sup>86</sup> The goal of keep-out zones would be to "clarify ambiguous activity before it became necessary to 'use or lose' offensive space weapons."<sup>87</sup>

Keep-out zones could decrease the effectiveness of certain co-orbital weapons and may discourage States from deploying such weapons. The smaller zones described above would not provide as much of a deterrent as the larger zones and the effectiveness of directed-energy weapons would not be meaningfully reduced.<sup>88</sup> The OTA report acknowledges that declared keep-out zones would have a great deal of challenges and chief among the challenges would be the response from other nations,<sup>89</sup> such as States creating more advanced weapons systems or establishing competing zones.<sup>90</sup>

#### b. Self-Defense Zones

The second type of zone considered in the US was self-defense zones (SDZ). This proposal was the product of an early 1980's study commissioned by the US DoD as a part of the *Commission on Integrated Long-Term Defense Strategy* (CILTDS).<sup>91</sup> The study produced a paper that concluded the US should seek an international agreement establishing SDZs in space instead of an international agreement banning weapons in space.<sup>92</sup> The proposal received consideration in the US Congress and was included in the final report of the CILTDS, entitled

<sup>&</sup>lt;sup>84</sup> *Ibid* at 18.

<sup>&</sup>lt;sup>85</sup> *Ibid* at 118.

<sup>&</sup>lt;sup>86</sup> *Ibid*.

<sup>&</sup>lt;sup>87</sup> Ibid.

<sup>&</sup>lt;sup>88</sup> *Ibid* at 138.

 $<sup>^{89}</sup>_{90}$  *Ibid* at 18.

 $<sup>^{90}</sup>$  *Ibid* at 138.

<sup>&</sup>lt;sup>91</sup> A commission established by US President Ronald Reagan, whose members included: Albert Wohlstetter, Henry Kissinger, Zbigniew Brzezinki, William P. Clark, and Bernard A. Schriever, among others. See *Discriminate Deterrence*, *Infra* note 93.

<sup>&</sup>lt;sup>92</sup> Albert Wohlstetter & Brian Chow, "Self-Defense Zones in Space" (July 1986) at 29 [unpublished], online: <www.albertwohlstetter.com>.

*Discriminate Deterrence* which was presented to the Secretary of Defense (SECDEF) and the Assistant to the President for National Security Affairs.<sup>93</sup> Future Vice President and then US Senator, Dan Quayle advocated for the pursuit of an agreement establishing SDZs. He described the zones as a means to "keep one side's satellites far enough apart from the other's to make an instantaneous surprise attack by either side virtually impossible."<sup>94</sup> At its core, such an agreement would apportion regions of specific orbits to States or groups of States with limited rights of passage.<sup>95</sup> The primary purpose of these zones would be adequate warning time before an attack.

SDZs differ from keep-out zones in three important ways. The first difference is SDZs protect critical missions instead of focusing on critical satellites. This idea is premised on creating redundancy in satellite systems so that an attack does not cause mission disruption. The second difference is that in GEO, the SDZ would create sectors for each State to place its satellites in. This proposal would result in larger areas of protection and provide an orderly use of GEO in the future. The third difference is that a State would have the authority to respond to violations. The responding state would have the right to inspect, expel, or make harmless the invading satellite.

<sup>&</sup>lt;sup>93</sup> US Congress, Commission on Integrated Long-Term Strategy, *Discriminate Deterrence: Report of the Commission on Integrated Long-Term Strategy* (January 1988) at 54, online:

<sup>&</sup>lt;http://usacac.army.mil/cac2/CSI/docs/Gorman/06\_Retired/01\_Retired\_1985\_90/26\_88\_IntegratedLongTermStrate gy\_Commission/01\_88\_DiscriminateDeterrence\_Jan.pdf> [*Discriminate Deterrence*].

<sup>&</sup>lt;sup>54</sup> Dan Quayle, "Making War Less Attractive: Space Self-Defense Zones", Editorial, *The Christian Science Monitor* (24 March 1986), online: <www.csmonitor.com/1986/0324/espace.html>, (At the time of the editorial, Senator Quayle served on the Senate Armed Services Subcommittee on Strategic and Theater Nuclear Forces. He later served as Vice-President of the US from 1988-1992.)

<sup>&</sup>lt;sup>95</sup> The proposed agreement and its details were drafted for and during the Cold War. As a result, the parameters of the SDZs are established to accommodate Western Alliance and the Soviet Bloc. The foundational elements of the SDZs would be:

<sup>1.</sup> The Western Alliance and Soviet Bloc would be apportioned a specific number of zones in different orbits for placement of critical satellites.

<sup>2.</sup> A violation of the established zone and its agreed upon transit rules by an invading satellite would allow the other State to render the invading satellite harmless, inspect, or expel.

<sup>3.</sup> Specific SDZs with unique parameters would be established in the following orbits: above geosynchronous orbits; geosynchronous orbits; and intermediate earth orbits. For technical reasons, there is no proposal for SDZs in the low-earth orbit (LEO).

<sup>4.</sup> There are specific numbers of satellites that are allowed to transit through the zone at a given time and each is given a maximum amount of time to transit through the zone.

<sup>5.</sup> States have the right to dispose of dead satellites that enter into their zone.

<sup>6.</sup> Not all satellites are placed in zones as only critical assets should be placed within a zone's protection. Wohlstetter, *supra* note 92 at 54-61.

The SDZ proposal could only be accomplished through a multilateral agreement and in GEO, because it is premised on regions being created in an orbit that is fixed relative to the Earth and on States agreeing to the placement of satellites in the particular regions. Without modification of the proposal or an amendment to the Outer Space Treaty, a unilaterally declared SDZ would appear to violate the non-appropriation principle found in Article II of the Outer Space Treaty.<sup>96</sup>

#### 3. Soviet Proposals for Safety and Security Zones

The US was not alone in considering the establishment of safety and security zones. Several Soviet writers supported the establishment of zones during the Cold War and were particularly concerned about the maneuverability of the Space Shuttle and its ability to conduct RPO.<sup>97</sup>

One Soviet writer proposed security zones around spacecraft. The State of registry of the concerned spacecraft would grant passage through the zone by an arrangement that would amount to a "specific form of temporary sovereign rights in a limited area of near-earth space."<sup>98</sup> Permission for passage would be dependent on the reason for the transit and could be refused for safety reasons.<sup>99</sup> If security zones were to be created by agreement instead of unilaterally, then the USSR would advocate for the zones to "prohibit outright the performance of maneuvers of flying near, approach, inspection, etc. of ships and stations of another country within the determined security zones."<sup>100</sup>

The USSR consideration of zones went well beyond critical satellites. In considering the legal order of future "space cities," another Soviet writer had no reservations in stating that zones

<sup>&</sup>lt;sup>96</sup> See Part III-D, *below*, for a discussion of the non-appropriation principle found in Article II of the Outer Space Treaty.

<sup>&</sup>lt;sup>97</sup> See Schwetjie, *supra* note 77.

<sup>&</sup>lt;sup>98</sup> B.G. Dudakov, "On the International Legal Status of Artificial Earth Satellites and the Zones Adjacent to Them" (1981) 24 Proc on L Outer Sp 97 at 100.

<sup>&</sup>lt;sup>99</sup> A. Rudev & P. Lukin, *Kosmos u Provo (Space and Law)*, (Moscow, 1980) at 74 cited in Russell, *supra* note 60 at 184.

<sup>&</sup>lt;sup>100</sup> *Ibid.* Interestingly, the USSR considered the close inspection and seizure of another State's space object as "space piracy." This term was used by Dudakov, because spacecraft "can be compared...to a naval ship on the high seas flying a sovereign state's colors." Essentially, the unauthorized close inspection or seizure of a space object belonging to another State would amount to an illegal assertion of jurisdiction over sovereign property. Dudakov declares that "an attempt to get aboard other states' satellites to inspect or seize them is an act of piracy granting the owner-state rights to resort to any means to protect its space object." He held this view although acknowledging that international law does not directly address "state-sponsored piracy." Dudakov, *supra* note 98 at 100.

would be necessary for the safety and security of a future space city.<sup>101</sup> He proposes that peaceful passage must be allowed whether or not the spacecraft will land at the space city and that the dimensions of any security zone must be determined by technical specialists.<sup>102</sup> It was his opinion that without security zones, it will be necessary to establish boundaries in outer space similar to territorial waters, thus requiring an amendment to the Outer Space Treaty.<sup>103</sup> This conclusion is based on the premise that space cities would be more vulnerable to attack than any structure on earth and would need special protection in space. Such vulnerability, it is argued, would be mitigated by an established zone of protection.

#### 4. Space Traffic Management and Safety and Security Zones

Since at least 1982,<sup>104</sup> governments and academics have recognized the need for a "rules of the road" or STM system in outer space to reduce the probability of on-orbit collisions, creation of space debris, and military conflicts. To date, the most extensive work addressing the challenges for STM is the *Cosmic Study on Space Traffic Management* completed in 2006 by the International Academy of Astronautics (IAA).<sup>105</sup> The IAA intentionally did not include military space operations rules in the scope of its study due to the apprehension of militaries to operate in an open manner.<sup>106</sup> As a result of the reluctance of militaries to disclose sensitive information regarding satellite operations, the IAA recommended other measures of STM be considered, "like 'keep-out zones', which might be particularly relevant and applicable to military space operations, thus safeguarding the particular security needs of the actors."<sup>107</sup> In considering this proposal, one author has even described "keep-out zones" as a Transparency and Confidence Building Measure (TCBM) to be used as an alternative to space arms control.<sup>108</sup> Not since the Cold War, has a government or other concerned body publicly called for or considered unilaterally declared zones outside of the larger STM system. In practice however, a State's declaration of a safety and security zone according to a voluntary TCBM or through a unilateral

 <sup>&</sup>lt;sup>101</sup> M.I. Lazarev, "Future Space Cities (International Legal Aspects)" (1980) 5 Ann Air & Sp L 529 at 532.
 <sup>102</sup> *Ibid.*

<sup>&</sup>lt;sup>103</sup> *Ibid*.

<sup>&</sup>lt;sup>104</sup> See L. Parek, "Traffic Rules on Outer Space" (Paper delivered at the Proceedings of the 25th Colloquium on the Law of Outer Space, Paris, France, 27 October 1982) at 37.

<sup>&</sup>lt;sup>105</sup> Contant-Jorgenson, *supra* note 4.

<sup>&</sup>lt;sup>106</sup> *Ibid* at 53.

<sup>&</sup>lt;sup>107</sup> *Ibid* at 54.

<sup>&</sup>lt;sup>108</sup> Peter L. Hays, "Space Law and the Advancement of Spacepower" in Lutes, *supra* note 68 at 451.

declaration will receive similar consideration under the law of outer space, as acceptance by other States would be on a voluntary basis.

- D. Methodology and Terminology
  - 1. Legal methodology A Comparative and Doctrinal Approach with Historical Perspective

This thesis employs both a doctrinal and comparative methodological approach with historical perspective. Because no State has declared safety and security zones in outer space, doctrinal methodology will be used to analyze the lawfulness of such zones under existing international space law. Before examining the current state of the law and how it may govern safety and security zones in outer space, it is important to explore prior proposals through the legislative history, government reports, public statements by government officials, State practice, and scholarship. The perspective will allow the thesis to develop with an understanding of why safety and security zones were studied and proposed in the past.

In Chapter 2, comparative methodology will be utilized to examine various types of zones established or contemplated in the sea, air, and cyber environments. The purpose of the comparison is to derive an understanding as to why States establish zones in different domains and how States react to such zones. The knowledge gained from this examination will then be synthesized into common characteristics that may inform the doctrinal methodology being used in Chapter 3 to identify the legal principles that would govern zones in outer space. The examination of exclusion zones on the high seas and adjoining international airspace will primarily focus on state practice and resulting customary international law, while some attention will be given to the *1982 UN Convention on the Law of the Sea* (UNCLOS).<sup>109</sup> Since there have been no exclusionary zones created in the cyber environment and it being unclear if zones are technically feasible, a review of the *Tallinn Manual on the International Law Applicable to Cyber Warfare* (Tallinn Manual)<sup>110</sup> and other scholarship will provide an understanding of the challenges faced in the cyber environment that might be informative for the space environment. The comparison of the different zones across domains will be conducted after distinguishing the

<sup>&</sup>lt;sup>109</sup> *1982 UN Convention on the Law of the Sea*, 10 December 1982, 1833 UNTS 3 (entered into force 16 November 1994) [UNCLOS].

<sup>&</sup>lt;sup>110</sup> Michael N. Schmitt, ed, *Tallinn Manual on the International Law Applicable to Cyber Warfare* (New York: Cambridge University Press, 2013) [*Tallinn Manual*].

legal constructs that surround each zone. An understanding of the legal environment in which each zone is created is crucial for an accurate comparison and identification of commonality and differences across the domains.

In Chapter 3, the thesis will contend that authoritative sources of law such as treaties, customary international law, decisions of the International Court of Justice (ICJ), and scholarship support, or at least allow, a State to unilaterally declare safety and security zones in outer space. The knowledge gained from the comparative analysis of zones in the sea, air, and cyber environments will be tested within the international space law regime once it has been identified using doctrinal methodology. Furthermore, the thesis will apply the legal principles that currently govern human activity in outer space and show how these principles allow for the establishment of unilaterally declared safety and security zones.

#### 2. A Note on Terminology

This work uses the term "security and safety zone" to describe an area surrounding a space object that has been declared by a State of registry as off-limits to other space objects. The term is meant to be interpreted broadly and is not given technical parameters.

#### Conclusion

As demonstrated in the Luch-Intelsat discussion, without communication or coordination the intent of RPO is not always apparent to other satellite operators. The dual-use nature of satellites make their status as a space weapon almost impossible to determine, so creating safety and security zones may be an attractive response and precaution. Technologies that are dual-use, such as RPO, perform both "peaceful and defensive task."<sup>111</sup> The requisite technology for using satellites for OOS, ADR, and a spaced-based ASAT is the "ability to maneuver on-orbit and accelerate rapidly and to be able to home in on a space object."<sup>112</sup> Small microsatellites bring even more challenges to the table than other dual-use technologies, because of the difficulty to track the movements of small space objects.<sup>113</sup> The ability of small satellites to go undetected or to operate in a non-threatening manner until just before approach lends itself to the establishment

<sup>&</sup>lt;sup>111</sup> Two examples of this type of technology are inspector and interceptor satellites. For example, a satellite could serve the purpose of monitoring another State's space object and then be employed as an ASAT. Laura Grego, "Technologies and Behaviors of Concern: What Threatens Long-Term Space Security and How Can These Threats be Monitored?" in UN, *Sustainable Space Security, supra* note 59 at 67.

<sup>&</sup>lt;sup>112</sup> *Ibid* at 71.

<sup>&</sup>lt;sup>113</sup> *Ibid*.

of safety and security zones. These zones would not necessarily protect the satellite from attack, but would provide a means of setting norms and assigning responsibility.

In space, simply having defensive space assets is not enough. States must know what activity other States find intolerable and what the expected response might be. This type of communication leads to deterrence. Without some understanding of other States' capabilities and desires, escalation may occur unintentionally. After studying the behavior of the US and Russia during the 1960's, Stephen Roberts and his colleagues determined, "[a] violent exchange between the superpower fleets (whether the result of deliberate choice, accident, misperception, or the actions of third parties) could not have been ruled out."<sup>114</sup> The reality is that escalation is always possible, but steps can be taken to lessen its potential in outer space. Safety and security zones may play a role in reducing ambiguity and providing confidence to States who operate in space, just as varying types of zones can provide transparency and confidence regarding operations on the high seas and air above.

<sup>&</sup>lt;sup>114</sup> Stephen S. Roberts, "The October 1973 Arab-Israel War", in Bradford Dismukes & James McConnell, eds, *Soviet Naval Diplomacy*, (New York: Pergamon Press, 1979) at 206.

## Chapter II The Need for Safety and Security Zones: A Look to the Sea, Air and Cyberspace

In Chapter 2, this thesis explores the use of zones in the sea, air, and cyber environments. As shown in the first chapter, no State has declared a safety and security zone in outer space. The practice of establishing zones on the high seas and adjoining airspace is robust and provides a rich resource for analogy. As States grapple with security concerns in the outer space environment, they will no doubt turn to past experience and established rules in other environments as a source of guidance. Through the process of examining zones in different environments, this chapter provides insight into how unilaterally declared zones may comport with international space law.

#### A. Usefulness and Limitations of Comparison with Analogous Environments

There has been much discussion in space law literature regarding the role of analogies from other environments in considering the development of the law governing outer space.<sup>115</sup> When such an exercise is undertaken, it must be done with an acknowledgement of the uniqueness of the environments being compared and the purpose of the rules being analyzed.<sup>116</sup> The words of Lord Mansfield ("There is nothing in law so misleading as a metaphor or an analogy")<sup>117</sup> serve as a reminder of the potential for disruption in the law from misapplied analogies instead of the intended goal of advancement. A more hopeful, yet equally cautionary, view of analogies was provided by Einstein when he said analogies have been "a source not only of the most fruitful theories, but also of the most misleading fallacies."<sup>118</sup> With the warnings in mind, there are constructive lessons to be gained from examining the law in other environments. The usefulness may result from identifying similarities from one environment that do fit in the new environment or to expose differences that prevent even a creative application. In this chapter

<sup>&</sup>lt;sup>115</sup> See Manfred Lachs, *The Law of Outer Space: An Experience in Contemporary Law-Making* (Leiden: Martinus Nijhoff Publishers, 2010) at 19; Hamilton DeSaussure, "The Freedoms of Outer Space and Their Maritime Antecedents" in Nandasiri Jasentuliyana, ed, *Space Law: Development and Scope* (Westport, CT: Praeger Publishers, 1992); Carl Q. Christol, ed, *Space Law: Past, Present, and Future* (Deventer, The Netherlands: Kluwer, 1991) at 341.

<sup>&</sup>lt;sup>116</sup> Lachs, *supra* note 115 at 20.

<sup>&</sup>lt;sup>117</sup> *Knox v Gye* (1871), LR 5 HL 656 at 676.

<sup>&</sup>lt;sup>118</sup> Lachs, *supra* note 115 at 20-21.

a comparison will be made between varying types of zones established or contemplated in the sea, air, and cyber environments through treaty and customary international law with a goal of identifying common characteristics among the zones that seem to foster international acceptance.

#### B. Zones as a Means to Maintain Security

The purpose of establishing zones in any environment results from a State acting in their security interests. Whether or not zones have a role in outer space will largely depend on their ability to secure critical space assets. What amounts to a security interest may be defined differently by States and according to the particular environment, thus it is important to understand how security is understood in international relations generally.<sup>119</sup> For example:

The Copenhagen School understands that security is a socially constructed concept and that discourse is a key element in the construction and identification of security issues. Based on the discourse which surrounds it, a public policy issue can be classified as non-politicized, politicized or securitized. A non-politicized issue is one which is excluded from the policy debate and ignored by policy. A politicized issue is identified as matter of public importance, brought into the policy discourse, and requires the commitment of public resources. A securitized issue is identified as a potential threat to the continued existence of the state. Once securitized, issues are perceived to be of such immediate importance that they are elevated above the ordinary norms of the political debate and the state acquires special rights to adopt extraordinary measures in order to protect itself.<sup>120</sup>

The Copenhagen School approach highlights the importance of security "in state decisionmaking and may warrant extraordinary steps to address particular issues."<sup>121</sup> The act of declaring zones of protection on the sea or in airspace can be seen as a response to a securitized issue, because zones normally are a response or preemption to a perceived or identified threat. A concern does exist that outer space activities are overly securitized and as a result there is less international cooperation and transparency.<sup>122</sup>

Another means of viewing security is through "human security." The focus of this term is the individual human being's "freedom from fear and the freedom from want" instead of the needs of the State. Even though "human security" is still much debated and not widely

<sup>&</sup>lt;sup>119</sup> Natalie Klein, *Maritime Security and the Law of the Sea* (Oxford: Oxford University Press, 2011) at 4 [Klein, *Maritime Security*].

<sup>&</sup>lt;sup>120</sup> John F. Bradford, "Japanese Anti-Piracy Initiatives in Southeast Asia: Policy Formulation and the Coastal State Responses" (2004) 26:3 Contemporary SE Asia J 480 at 481.

<sup>&</sup>lt;sup>121</sup> Klein, *Maritime Security*, *supra* note 119 at 5.

<sup>&</sup>lt;sup>122</sup> Columba Peoples, "The Securitization of Outer Space: Challenges for Arms Control" (2011) 32:1 Contemporary Sec Pol'y 76 at 76.

accepted,<sup>123</sup> it is credited with expanding the discussion of security beyond the military policy of a state to now include political, economic, societal, and ecological.<sup>124</sup>

It is in this broader view of security that zones in the various environments will be considered. In today's space environment, security no longer only implies military interests as it did before and during the Cold War. Because of globalization and States' interdependence, security now entails the mutual vulnerability created when threats in one part of the world impact the security of States around the globe.<sup>125</sup> As States face real or perceived threats to national security, their actions in one environment will likely influence or at least inform their responses in other environments. For this reason, a look to the sea, air, and cyber domains is warranted.

#### C. Law of the Sea and Zones

Since the publishing of Hugo Grotius' elaborate work, *Mare Liberum*, in 1609, the doctrine of freedom of the seas emerged as the prevailing theory on international relations in the use of the oceans.<sup>126</sup> As the number of seafaring States wishing to exploit natural resources increased and naval warfare advanced, the oceans of the world were divided into five areas: internal waters, territorial sea, contiguous zone, exclusive economic zone (EEZ) and the high seas. The foregoing analysis will focus on the high seas where States enjoy freedom of use and

<sup>&</sup>lt;sup>123</sup> See e.g., S. Neil MacFarlane & Yuen Foong Khong, *Human Security and the UN: A Critical History* (Bloomington, IN: Indiana University Press, 2006); Edward Newman, "A Normatively Attractive but Analytically Weak Concept" (2004) 35:3 Security Dialogue 358; David Roberts, "Human Security or Human Insecurity? Moving the Debate Forward" (2006) 37:2 Security Dialogue 249; Alex J. Bellamy & Matt McDonald, "The Utility of Human Security: Which Humans? What Security? A Reply to Thomas and Tow" (2002) 33:3 Security Dialogue 373; Juliet Pietsch & Ian McAllister, "Human Security in Australia: Public Interest and Political Consequences" (2010) 64:2 AustI J of Intl Aff 225 at 226-30.

<sup>(2010) 64:2</sup> Austl J of Intl Aff 225 at 226-30.  $^{124}$  Klein, *Maritime Security, supra* note 119 at 6.

<sup>&</sup>lt;sup>125</sup> *Ibid* at 5-6.

<sup>&</sup>lt;sup>126</sup> Ram P. Anand, "Freedom of the Seas: Past, Present, and Future" in Hugo Caminos, ed, *Law of the Sea*, (Hants, UK: Dartmouth Publishing, 2001) at 216. Anand provides a thorough overview of the development of the law of the sea from an unbiased perspective. Attention is given to the early development of the law of the seas in different parts of the world and acknowledgement that Asian and African cultures likely practiced freedom of the seas long before Europeans. In fact, he credits the Asian adherence to freedom of the seas as the incubator for Portugal's early dominance of the Eastern spice trade. See *Ibid.* The principles of *mare clausum* and *mare liberum* have been subject to debate through history and UNCLOS attempts to balance the competing theories. Dale G. Stephens, "The Impact of the 1982 Law of the Sea Convention on the Conduct of Peacetime Naval/Military" (1998-99) 29:1 Cal W Intl LJ 283 at 284.
navigation subject to certain conditions found in UNCLOS<sup>127</sup> and customary international law.<sup>128</sup> Similar to outer space, all activities on the high seas must be for peaceful purposes<sup>129</sup> and no State may exercise sovereignty on any part.<sup>130</sup> The guiding principle for international relations is "due regard for the interests of other states in their exercise of the freedoms of the high seas."<sup>131</sup>

It is in this area of the oceans that the law of the sea lends analogous value for the law of outer space. The comparison requires a recognition that the law of the sea relative to the high seas has developed through centuries of state practice and most recently codified substantially in UNCLOS. As such, the following section will examine States' practice in declaring and enforcing warning, exclusionary, and safety zones on the high seas and in one instance, the EEZ.

Military activities in international waters (those waters beyond the territorial sea) include, but are not limited to: intelligence gathering, reconnaissance, maneuvering, flight operations, aerial surveillance, and military exercises.<sup>132</sup> Maritime States undertake significant military operations on the high seas to project power for the purpose of protecting and securing the entirety of their individual interests around the world.<sup>133</sup> As globalization has developed and the law of the sea has become more complex. States are increasingly using their naval power to resolve disputes regarding resources, pollution, security, and navigation.<sup>134</sup> In this way, military activities on the high seas should not be viewed as only a means of preparing for future naval warfare, but also as a means of preserving diplomatic and economic relations.

<sup>&</sup>lt;sup>127</sup> UNCLOS, *supra* note 109. The US is not a party to UNCLOS; however, government officials have stated on numerous occasions that the US regards UNCLOS as "embodying international law concerning traditional uses of the sea." See e.g. Statement of Ambassador Sichan Siv, US Representative on the UN Economic and Social Council before the General Assembly on 27 November 2001 as cited in Marjorie B. Paulsen, ed, Law of the Sea (New York: Nova Science Publishers, 2007) at 197.

<sup>&</sup>lt;sup>128</sup> The freedoms on the high seas, with some conditions: navigation; overflight; to lay submarine cables and pipelines; to construct artificial islands and other installations permitted under international law; fishing; and scientific research. UNCLOS, supra note 109, art 87, para 1.

<sup>&</sup>lt;sup>129</sup> *Ibid.* art 88.

<sup>&</sup>lt;sup>130</sup> *Ibid*, art 89.

<sup>&</sup>lt;sup>131</sup> *Ibid*, art 87; See Klein, *Maritime Security*, *supra* note 119 at 45.

<sup>&</sup>lt;sup>132</sup> See Raul Pedrozo, "Military Activities in the Exclusive Economic Zone: East Asia Focus" (2014) 90 Intl L Stud 514.

<sup>&</sup>lt;sup>133</sup> Scott C. Truver, "The Law of the Sea and Military use of the Oceans in 2010" (1985) 45:6 La L Rev 1221 at 1221 ("Sea power will be a fundamental tool of coercive and supportive diplomacy employed by coastal and maritime states alike to safeguard all their interests in the oceans, particularly in light of the potential for international tension and crisis to arise over ocean rights and obligations." at 1221).

<sup>&</sup>lt;sup>134</sup> Daniel P. O'Connell, *The Influence of Law on Sea Power* (Manchester: Manchester University Press, 1975) at 10. The focus on power projection is primarily a focus of the Western naval powers, while regional navies are concerned with sea denial operations of potential threats. Sam Bateman, "Security and the Law of the Sea in East Asia: Navigational Regimes and Exclusive Economic Zones" in David Freestone, Richard Barnes & David M Ong, eds, The Law of the Sea: Progress and Prospects (Oxford: Oxford University Press, 2006) at 366.

The establishment of zones on the high seas has historically been directly related to military operations on the high seas and for the purpose of excluding vessels from a certain area. The lawfulness of such practice has not enjoyed universal support; however, as States become increasingly concerned about threats to national security, an emerging practice is to operate areas or zones for the purpose of gathering information from approaching vessels and aircraft. This practice results from a common interest among States to know where vessels are located, who is operating the vessel, and for what purpose the vessel in its particular location. "The purpose of these zones usually has been to warn other users of the sea of dangers, to limit the area of combat operations, to deny adversaries use of water and air space, and/or to avoid targeting platforms that do not present an actual threat."<sup>135</sup> In this section, the review of various zones declared during times of peace and times of conflict show that the international acceptance of zones depends on a number of factors. In assessing whether a particular zone construct and the actions within the zone show the requisite due regard, the States should consider the extent, duration, and location of the zone. There is no priority of activities on the high seas, so the "balance is one between relevant freedoms."<sup>136</sup>

#### 1. Warning Areas and Zones

The first zones to be analyzed are warning areas and warning zones.<sup>137</sup> These zones are often declared when States conduct or plan to conduct military activities<sup>138</sup> on the high seas during times of peace. States have a right to conduct military activities on the high seas,<sup>139</sup> including weapons testing.<sup>140</sup> Warning areas are declared to make other States aware of the

<sup>&</sup>lt;sup>135</sup> Dennis Mandsager, "Foreword to 2006 Edition" in Richard Jacques, ed, *Maritime Operational Zones* (Newport, RI: US Naval War College, 2013).

<sup>&</sup>lt;sup>136</sup> Klein, *Maritime Security*, *supra* note 119 at 54 ("One state could make a claim that its fishing vessels were being denied their freedoms to fish because of the military activities being undertaken by another state within an area" at 54).

<sup>54).</sup> <sup>137</sup> These terms are often used interchangeably in literature, but the US Navy uses the terms to describe different concepts as discussed in this section.

<sup>&</sup>lt;sup>138</sup> See Pedrozo, *supra* note 132.

<sup>&</sup>lt;sup>139</sup> "So, battle fleets in past ages steamed in formations, conducted manoeuvres, and engaged in gunnery practice extending over hundreds of square miles. Provided that the rules of the road were observed and the range was kept clear, this was a lawful use of the high seas because other ships in the area continued to navigate without being diverted." Daniel P O'Connell, *The International Law of the Sea*, vol 2 (Oxford: Clarendon Press, 1984) at 809.

<sup>&</sup>lt;sup>140</sup> Arguably, States have the right to test nuclear weapons on the high seas. The legality of nuclear weapons testing has been the subject of the *1963 Treaty Banning Weapon Tests in the Atmosphere, in Outer Space and Under Water,* of which China and France are not parties, and the *1998 Comprehensive Nuclear Test-Ban Treaty*, which has not entered into force, but there does not appear to be sufficient state practice and *opinio juris* to establish such a ban in customary international law. Klein, *Maritime Security, supra* note 119 at 54-55. The ICJ did potentially have the opportunity in the Nuclear Tests cases to decide the lawfulness of nuclear weapons testing on the high seas and their

potential hazards caused by the military operation in the area, <sup>141</sup> while warning zones are established by a commander of a military vessel in an uncertain operating environment to "sort out the common operational picture and ascertain the intent on inbound entities."<sup>142</sup> These tests and the declared warning areas adjacent to the tests have caused considerable consternation among states and generated decades of academic debate,<sup>143</sup> but in certain circumstances zones may be necessary to ensure the safety of others.<sup>144</sup>

#### a. Warning Areas

The US advocated the legality of warning areas at the First UN Conference on the Law of the Sea. Lawfulness, the US argued, depended on a number of factors, including comity and voluntary compliance and a reasonable duration and size and creation in an isolated location.<sup>145</sup> The US continues to establish warning areas in the vicinity of military activities and maintains that vessels are only prevented from interfering with the operations ongoing within the zone, just as is required outside the zone.<sup>146</sup> In practice, the US does not forcibly deny access to warning areas, but creates smaller "launch safety zones" within the larger warning area where access is denied to unauthorized vessels. France holds a more stringent position by asserting it has the

effect on the exercise of high seas rights and freedoms during litigation initiated by Australia and New Zealand against France. Before a decision was announced, France rendered the case moot by issuing a statement that it would conduct underground nuclear testing instead of atmospheric. *Nuclear Tests Cases (Australia v France, New Zealand v France)*, Judgment [1974] ICJ Rep 253 at para 34. But see, V.F. Tsarev, "Peaceful Uses of the Sea: Principles and Complexities" (1988) 12:2 Marine Pol'y 153 (Tsarev argues that the following items are prohibited on the high seas, because they interfere with the interests of other States in using the sea: "tests of nuclear weaponry; establishing naval and aircraft proving grounds; combat training areas with close proximity to the shores of foreign states or navigation routes of significant importance to international navigation; missile, torpedo, artillery, and other shooting, in particular, in areas allocated by international programmes for scientific research and requiring the permanent presence of scientific research vessels for certain periods of time; and the installation of autonomous buoy stations." at 156-57).

<sup>&</sup>lt;sup>141</sup> Jacques, *supra* note 135 at 2-1.

<sup>&</sup>lt;sup>142</sup> US Navy, NWP 1-14M, *The Commander's Handbook on the Law of Naval Operations* (Newport, RI: Navy Warfare Library, July 2007) at para 4.4.7 [*Navy Handbook*].

<sup>&</sup>lt;sup>143</sup> The lawfulness of warning areas is not settled and served as the subject of a rigorous academic debate between Myres McDougal and Emanuel Margolis. See Emanuel Margolis, "The Hydrogen Bomb Tests and International Law" (1955) 64 Yale LJ 629; Myres S. McDougal & Norbert A. Schlei, "The Hydrogen Bomb Tests in Perspective: Lawful Measures for Security" (1955) 64 Yale LJ 648; Myres S. McDougal, "The Hydrogen Bomb Tests and the International Law of the Sea", Editorial Comment, (1955) 49 AJIL 356.

<sup>&</sup>lt;sup>144</sup> "Engaging in any live-fire military exercises creates dangers and requires the establishment of a warning or exclusionary zone to protect others using the affected ocean area." Jon M. Van Dyke, "Military Ships and Planes Operating in the Exclusive Economic Zone of Another Country" (1991) 28:1 Marine Pol'y 29 at 35.

<sup>&</sup>lt;sup>145</sup> John M. Van Dyke, "Military Exclusion and Warning Zones on the High Seas" (1991) 15:3 Marine Pol'y 147 at 157-58 [Van Dyke, "Exclusion & Warning Zones"].

<sup>&</sup>lt;sup>146</sup> The US avoids using "prohibited" in its notifications to mariners and airmen, so that is it is clear that the US is not exercising control over the area. John R. Brock, "Legality of Warning Areas as Used by US" (1966-67) 21:3 JAG J 69 at 69-70.

right to board and seize vessels that violate its established zones, because France is exercising a freedom of the high seas by conducting weapons testing and the offending vessel is infringing on its sovereign right.<sup>147</sup>

On numerous occasions, members of the environmentalist organization, Greenpeace, entered the warning areas and launch safety zones of the US and France in an attempt to thwart weapons testing. On one instance, four Greenpeace vessels flying the Netherlands flag interfered and successfully stopped the US from test launching a Trident II, D-5 missile from a nuclear submarine off the coast of Florida. Greenpeace returned for another scheduled launch and the US used some amount of force<sup>148</sup> to prevent the vessel from entering the launch safety zone and successfully launched the missile. The Netherlands never objected to the US action and instead, rebuffed Greenpeace's interference with the launch as an "abuse of freedom." France takes a more aggressive approach to vessels interfering with their launches. On several occasions, France boarded, seized, and heavily damaged vessels carrying Greenpeace protestors. The vessels boarded by France were flying Canadian and New Zealand flags. As a result, Canada and New Zealand filed protests with the French government regarding their interference with freedom of navigation on the high seas and illegal arrests.<sup>149</sup>

The actions of the French and US in forcibly removing Greenpeace from a warning area is reflective of the potential consequences of establishing such a zone and for violating the zone. According to Van Dyke, both States acted outside the allowable norms. He argues:

If a vessel chooses to enter an exclusionary or warning zone on the high seas, the nation seeking to test its missiles or conduct other military operations in the vicinity cannot lawfully seize or remove that vessel without the permission of the nation whose flag, the vessel flies.<sup>150</sup>

Even when warning areas are established in a reasonable manner and with due regard for the corresponding interests of other States, the State conducting the military operations remains responsible for its actions. It has been argued that under certain circumstances, the establishment of a warning area reasonably related to military operations may satisfy the due regard

<sup>&</sup>lt;sup>147</sup> Van Dyke, "Exclusion & Warning Zones", *supra* note 145 at 160.

<sup>&</sup>lt;sup>148</sup> The US Navy described the force as "nudging" the Greenpeace vessel, while a Greenpeace spokesperson claimed the vessel was "repeatedly rammed." Jeffrey Schmalz, "After Skirmish with Protesters, Navy Tests Missile" *The New York Times* (5 December 1989) B18, online: <www.nytimes.com/1989/12/05/us/after-skirmish-with-protesters-navy-tests-missile.html>.

<sup>&</sup>lt;sup>149</sup> Van Dyke, "Exclusion & Warning Zones", *supra* note 145 at 160-61.

<sup>&</sup>lt;sup>150</sup> *Ibid* at 169.

requirement when the military activities could harm other States.<sup>151</sup> In this view, a State's failure to establish a warning area could be a violation of its obligation of due regard to others. It is doubtful warning areas alone can satisfy a State's due regard requirement when conducting military operations on the high seas; however, the establishment of such a zone can provide some transparency regarding military operations. As such, vessels enter the warning area with knowledge that harm may come their way and such a vessel must meet its obligation to show due regard of the interests of the State carrying out the military operation.

Other States can enter warning areas and conduct surveillance and gather intelligence or any other lawful actions as long as they do not interfere with the other States' lawful actions.<sup>152</sup> On several occasions the US and USSR entered the other's warning areas after being requested not to do so. There are no reported incidents of confrontations or protests resulting from these engagements between the US and USSR,<sup>153</sup> and as a result, it is representative of the lawful limits of warning areas. If a warning area is created and then a State enters the area and interferes with a lawful activity, the offending State is arguably not showing the requisite due regard. On the other hand, if a State conducting military operations does not declare a warning area and another State's vessel is harmed by the military activity, the State who conducted the test potentially failed to show the requisite due regard and is likely liable for any resulting damage. Warning areas have a useful purpose and are lawful as long as they do not unreasonably impact other States' freedom of navigation and use. The duration, location, and size are all factors that must be reasonable in light of the military operations being conducted.

#### b. Warning Zones

Warning zones are distinguished from warning areas, in that they are established by vessel commanders in an area surrounding ongoing military operations in an attempt to determine the presence of any outside threats.<sup>154</sup> "[W]arning zones merely serve to protect the naval vessels from attack or from other illegal activities and are generally recognized as in

<sup>&</sup>lt;sup>151</sup> Klein, *Maritime Security*, *supra* note 119 at 57.

<sup>&</sup>lt;sup>152</sup> Jacques, *supra* note 135 at 2-2.

<sup>&</sup>lt;sup>153</sup> See Edward H. Kolcum, "Soviet Intelligence Ship Intrudes on Trident Test", *Aviation Weekly* (25 January 1982) at 21, online: <a href="http://archive.aviationweek.com/issue/19820125#!&pid=20">http://archive.aviationweek.com/issue/19820125#!&pid=20</a>; Charles R. Hunt (Commander, US Navy), "Greenpeace and the US Navy: Confrontation on the High Seas", (Paper presented at US Naval War College, Newport, RI, 14 May 1990) cited in Van Dyke, "Exclusion & Warning Zones", *supra* note 145 at 158. <sup>154</sup> Navy Handbook, supra note 142 at 1-14M, para 4.4.7.

accordance with international law.<sup>155</sup> The goal of warning zones is to give commanders "sufficient time and separation from potential threats in order to assess hostile intent.<sup>156</sup> The justification for warning zones is self-defense. This justification arose out of attacks such as the bombing of the Beirut Airport in 1983 where a truck detonated after driving into the airport and killing nearly 250 US military members. This attack led the US to take a more defensive posture in the world due to the increasing threat posed by destructive devices that could be deployed by highly maneuverable and small vehicles, such as cars, fast boats, and lightweight aircraft.<sup>157</sup>

Just like warning areas, States are to declare the parameters of warning zones through Notice to Mariners (NOTMAR), Notice to Airmen (NOTAM), or Special Warning to Mariners.<sup>158</sup> Warning zones are used to "notify other States' vessels and aircraft of ongoing [...] operations and that vessels and aircraft whose intentions are unclear risk being subjected to defensive action within the operational area."<sup>159</sup> Crucial to the international acceptance of warning zones is the preservation of the freedom of the high seas and the duty to show due regard within the zones. As the next example shows, any zone must be clearly and timely announced.

The 2013 encounter between the USS Cowpens and the Chinese aircraft carrier Liaoning resulted from China failing to issue either a NOTMAR or NOTAM before conducting a military exercise.<sup>160</sup> The USS Cowpens did not heed warnings from the Liaoning to stop or change course during a mission in the South China Sea. As a result, an amphibious docking ship from the Liaoning maneuvered approximately 100 yards in front of the Cowpens and stopped, forcing the Cowpens to take evasive action. The commanding officers of the two ships dissolved the

<sup>&</sup>lt;sup>155</sup> Wolff Heintschel von Heinegg, "Current Legal Issues in Maritime Operations: Maritime Interception Operations in the Global War on Terrorism, Exclusion Zones, Hospital Ships, and Maritime Neutrality" (2006) 80:1 Intl L Stud 207 at 213-14.

 $<sup>^{156}</sup>$  Jacques, *supra* note at 135 at 2-3.

<sup>&</sup>lt;sup>157</sup> *Ibid*.

<sup>&</sup>lt;sup>158</sup> *Ibid* at 2-5.

<sup>&</sup>lt;sup>159</sup> *Ibid* at 2-2. "On 3 July 1988, *USS Vincennes* fired at and destroyed *Iran Air flight 655*, a civilian airliner, after the airbus' repeated failure to respond to warnings (the airbus was mistakenly determined by the Tactical Information Coordinator to be descending, an attack profile indicator). At the time, The Commanding officer of the *Vincennes* believed himself and the *USS Elmer Montgomery* to be under a coordinated air and sea attack from Iranian forces. Prior to the attack, *Vincennes*' helicopter had been fired upon by Iranian small boats." *Ibid*. See US Office of the Secretary of Defense, *Formal Investigation into the Circumstances Surrounding the Downing of Iran Air Flight 655* on 3 July 1988 (28 July 1988), online:

<sup>&</sup>lt;www.dtic.mil/cgibin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA203577>.

<sup>&</sup>lt;sup>160</sup> Raul Pedrozo, "The Bull in the China Shop: Raising Tensions in the Asia-Pacific Region" (2014) 90:1 Intl L Stud 66 at 77.

potentially escalatory situation and both ships went their separate ways.<sup>161</sup> Several weeks later, China's Ministry of National Defense accused the *Cowpens* of not following the NOTMAR issued by China regarding the warning zone. Unfortunately, China issued the NOTMAR the day after the encounter with the *Cowpens*<sup>162</sup> and as such, the zone parameters were not known by the *Cowpens* commander. Even if China had issued the NOTMAR before the operation, the reckless act of stopping a boat 100 yards in front of a warship infringed upon the *Cowpens*' freedom of navigation on the high seas and fell below the due regard standard.

The value in examining warning areas and warning zones comes from their mobility and use during times of peace. The legal justifications for warning areas related to non-nuclear military operations can provide a framework for considering a similar challenge in outer space. States have important security interests in carrying out military maneuvers on the high seas, but the law of the sea does not prioritize military operations over other users. As a result, States have used warning areas to communicate potentially dangerous conditions to other States. The repeated entrance of Russian and US ships into each other's zones reflects the purpose of the zone and the legal and practical limitations. As the French and Greenpeace encounter demonstrates, States cannot use force to deny other users access to the zone. Unless the situation triggers a right to respond in self-defense, there is no authority to forcibly remove another vessel from a warning area. On the other hand, warning zones are declared to notify other users that the vessel is in a state of heightened alert and is operating in a defensive posture. Once again, the State cannot use force against a vessel for violating an established zone, but the State can use the zone as a means of limiting traffic so hostile actions can be more easily distinguished from peaceful actions. The threat of highly maneuverable, small, and fast weapon delivery methods at sea present challenges similar to RPO in outer space. States must develop lawful means to identify threats as early as possible, so that they may adequately exercise the right of self-defense. The declaration or establishment of a warning area or zone does not give a State additional rights under international law and must always be done with due regard for the interests of other users.

<sup>&</sup>lt;sup>161</sup> "Captain's Radio Chat Averted Near-Collision between Liaoning, USS Cowpens" *South China Morning Post*, (17 December 2013), online:

<sup>&</sup>lt;a href="http://article.wn.com/view/2013/12/17/Captains\_radio\_chat\_averted\_nearcollision\_between\_Liaoning\_U/>.">http://article.wn.com/view/2013/12/17/Captains\_radio\_chat\_averted\_nearcollision\_between\_Liaoning\_U/>.</a>

<sup>&</sup>lt;sup>162</sup> Bill Gertz, "Chinese Warning a Day Late" *The Washington Times* (16 January 2014) A-10.

### 2. Security and Exclusionary Zones

The next zones to be examined are security and exclusion zones. These zones are normally declared during times of armed conflict or in anticipation of armed conflict for the purpose of excluding vessels from a particular area. The lawfulness of these zones is generally accepted during times of armed conflict when belligerents use the zones to signify areas of combat so that non-participant and neutral shipping does not become collateral damage. Prior to the recognition of maritime zones such as territorial waters and the contiguous zone, coastal States used security zones to protect their territory from national security threats. Even with the firm establishment of maritime zones, States have continued to establish security zones within and beyond the already existing zones,<sup>163</sup> but such declarations have not received international recognition.

The impact of security zones may be best considered by the policing that is used to enforce the zone and whether the zone is established in the territorial waters or on the high seas. If the goal of creating a zone is to exclude certain vessels and the State has no authority to seize, board, or expel vessels that violate the zone, then the State's interest in creating a zone must be questioned. When the zone extends beyond the territorial waters, the impact on commercial navigation, the environment, and access to resources in the area of the zone would all need to be considered when determining the lawfulness of exclusionary zones. In the end, it is unclear the establishing State would be afforded any policing power within these unilaterally established zones and thus, would have no lawful means of enforcement. Security zones, unlike warning areas and zones, are not generally accepted under international law, because of the lack of clarity that usually surrounds the zones and the potential for abuse.<sup>164</sup>

In contrast to strict security and exclusion zones, States have seemingly recognized that coastal States have a security interest in gathering as much information as possible about vessels approaching its territorial waters. With this potential common security interest as the focus, States appear to accept information zones. In these zones, vessels intending to enter the inland

<sup>&</sup>lt;sup>163</sup> See e.g. Nicaragua established a 25-mile security zone in 1983 in response to a perceived threat from covert US operations. Vietnam and North Korea have created security zones beyond their territorial waters, while with other Asian countries have established zones inside their territorial waters. Frederick C. Leiner, "Maritime Security Zones: Prohibited Yet Perpetuated" (1983-84) 24:4 Va J Intl L 967 at 985. The reasoning behind North Korea's 50-mile military boundary zone was "reliably safeguard[ing] the interests and sovereignty of the country." Choon-Ho Park, "The 50-Mile Military Boundary Zone of North Korea" (1978) 72:4 AJIL 866 at 866.

<sup>&</sup>lt;sup>164</sup> Klein, *Maritime Security*, *supra* note 119 at 60.

waters or port of the coastal state are required to provide specific information. Failure to comply typically means the vessel is unable to dock in the coastal State or the vessel will be interdicted by the establishing State's policing authority.

For example, in late 2004, Australia created a "Maritime Identification Zone" that required vessels intending to enter Australian ports and those in the EEZ, no matter if the vessel intended to enter an Australian port, to provide specific information to the Australian authorities when the vessel was 1,000 miles from shore.<sup>165</sup> Failure to provide information put the vessel at risk of Australian interdiction. In response, nearby States objected and consequently Australia changed the name of the zone to Australian Maritime Identification System (AMIS) and now Australia considers a vessel's compliance to be voluntary.<sup>166</sup>

Present-day worries about maritime security demonstrate that coastal states are growing more "concerned about activities at sea that may have severe repercussions for order on land."<sup>167</sup> Klein summarizes the rational for security zones based on information gathering and the balance such zones must strike:

The shared quest for knowledge as to what is being done, where, and by whom has driven assertions of security zones. While the abstract concept of a zone for security purposes is usually rejected as a further infringement on the freedom of the seas, it is arguable that zones are being created and accepted for information purposes. The actions that may be taken subsequent to the acquisition of this knowledge then becomes a question of law enforcement for the states concerned."<sup>168</sup>

Klein divides the legal analysis of zones into two parts. First, does the creation of the zone violate the State's international obligations and second, is the enforcement of the zone compatible with international law. Much like Air Defense Identification Zones (ADIZ),<sup>169</sup> security zones which focus on information gathering and domain awareness, and not a denial of operations, seem to be acceptable to the international community and represents a common interest among States.<sup>170</sup>

<sup>&</sup>lt;sup>165</sup> Declaration by the former Prime Minister of Australia, John Howard, cited in Natalie Klein, "Legal Implications of Australia's Maritime Identification System" (2006) 55:2 ICLQ 337 at 337.

<sup>&</sup>lt;sup>166</sup> Natalie Klein, "Legal Limitations on Ensuring Australia's Maritime Security" (2006) 7 Melbourne UL Rev 306 at 334.

<sup>&</sup>lt;sup>167</sup> Klein, *Maritime Security*, *supra* note 119 at 61.

<sup>&</sup>lt;sup>168</sup> Ibid.

<sup>&</sup>lt;sup>169</sup> See Part II-D, *below*, for more information on ADIZs.

<sup>&</sup>lt;sup>170</sup> Klein, *Maritime Security*, *supra* note 119 at 60.

# 3. Maritime Exclusion Zones During Times of Armed Conflict

The next subset of naval zones to be analyzed are exclusion zones that have been declared during times of armed conflict. Seafaring States engaged in armed conflict have declared different types of zones that have been described as, "war zones," "exclusion zones," and "barred areas." Other concepts that have similar effects are "defensive bubbles" and "blockades."<sup>171</sup> These zones have been described as "one of the most controversial issues in the law of armed conflict at sea" and the question of their lawfulness "remains unresolved."<sup>172</sup> States who are not parties to the armed conflict often find exclusion zones to be unlawful, because of the negative impact on freedoms of navigation and use on the high seas.

The history of exclusion zones shows the evolution of the law can be placed into three historical stages: (1) The Russo-Japanese War of 1904-05; (2) World War I and subsequent conflicts; and (3) the San Remo Manual on International Law Applicable to Armed Conflict at Sea (San Remo Manual).<sup>173</sup> The historical progression of State practice in establishing and enforcing exclusion zones in times of armed conflict has resulted in the identification of a set of factors identified by the group of experts who drafted the *San Remo Manual*.<sup>174</sup> The factors summarize and codify the state practice observed through the history of exclusion zones and provide a test by which an exclusionary zone may be measured.

# a. Russo-Japanese War of 1904-05: Defense Zones

The zones declared by Japan during the Russo-Japanese War of 1904-05 are not commonly included in discussions of exclusion zones because of the stark differences between the defensive zones declared by Japan and later zones established during and following World War I. The Japanese zones extended twenty miles from its coast and the zone parameters were detailed in an official ordinance.<sup>175</sup> The purpose of the zones was to prevent unauthorized vessels

<sup>&</sup>lt;sup>171</sup> Sandesh Sivakumaran, "Exclusion Zones in the Law of Armed Conflict at Sea: Evolution in Law and Practice" (2016) 92:1 Intl L Stud 153 at 154-55 ("The uncertainty [regarding legality] was not helped by different terms being used to describe the same practice." Ibid).

<sup>&</sup>lt;sup>172</sup> Christopher Michaelsen, "Maritime Exclusion Zones in Times of Armed Conflict at Sea: Legal Controversies Still Unresolved" (2003) 8:2 J of Conflict & Sec L 363 at 364.

<sup>&</sup>lt;sup>173</sup> Sivakumaran, *supra* note 171 at 155.

<sup>&</sup>lt;sup>174</sup> Louise Doswald-Beck, ed, San Remo Manual on International Law Applicable to Armed Conflicts at Sea (Cambridge: Cambridge University Press, 1995) [*San Remo Manual*]. <sup>175</sup> See Imperial Ordinance No 11 (23 January 1904), reprinted in US Navy War College International Law Studies,

International Law Situations with Solutions and Notes, vol 12 (Washington, DC: US Naval War College, 1912) at

from gaining close proximity to the Japanese coast and specifically, naval ports. Japan prohibited all vessels, other than Japanese naval vessels, from entering the zone from sunset to sunrise and for all vessels to follow the direction of the Japanese official responsible for the area. If a vessel was deemed to have violated this rule in some way, Japan reserved the right to order the vessel to depart the zone and if necessary, Japan reserved the right to use force.

There were no reported instances of Japan using force against a violating vessel, although Japan did capture the Quang-nam, a vessel flying the French flag, in the declared defense zone and took it as a prize. Japan believed the vessel was engaging in reconnaissance, even though France was a neutral State in the ongoing conflict.<sup>176</sup> The lawfulness of taking the vessel as a prize was subject to determination by the Prize Court at Sasebo. The court found that the route taken by the vessel was clearly for the purpose of reconnaissance and Japan was within its rights to condemn the vessel and take it as a prize. On appeal, the Higher Prize Court found no issue with the defense zone and the vessel's presence in the zone was considered to support the finding of the court.<sup>177</sup>

No State protested the Japanese zones and commentators found the zones to be a lawful action taken by a belligerent during an armed conflict.<sup>178</sup> Although Japan's zone extended beyond its recognized territorial waters, it was posited as customary international law at the time<sup>179</sup> that a belligerent "may be obliged to assume in time of war for his own protection a measure of control over the waters which in time of peace would be outside of his jurisdiction."<sup>180</sup> Clearly, the purpose of Japanese zones was the defense of Japanese territory and naval assets and the means and methods used appear to reasonably relate to that purpose without unreasonably infringing upon neutral States' high seas freedoms. The zones to be considered next reflect a more offensive purpose and amounted to "free fire zones."<sup>181</sup>

<sup>122,</sup> online: <https://www.usnwc.edu/getattachment/f6af26bc-a409-40d1-949c-498c3507e5f5/vol-12-International-Law-Situations-with-Soluti.aspx> [Naval War College, International Law Situations]. <sup>176</sup> L.F.E. Goldie, "Maritime War Zones & Exclusion Zones" (1991) 64 Intl L Stud 156 at 159.

<sup>&</sup>lt;sup>177</sup> Sivakumaran, *supra* note 171 at 157.

<sup>&</sup>lt;sup>178</sup> Goldie, *supra* note 176 at 160.

<sup>&</sup>lt;sup>179</sup> Julius Stone, Legal Controls of International Conflict: A Treatise on the Dynamics of Disputes and War Law (Rinehart, New York, 1954) at 572.

<sup>&</sup>lt;sup>180</sup> Navy War College, International Law Situations, supra note 175 at 128.

<sup>&</sup>lt;sup>181</sup> Free fire zones are defined as: "A military combat zone in which there are no restrictions on the use of fire power." Oxford Dictionaries Online, "Free fire zone" (July 2016), online:

<sup>&</sup>lt;www.oxforddictionaries.com/definition/american english/free-fire-zone>.

### b. World War I and Beyond: Free Fire Zones

During World War I, Germany used vessels flying the flag of neutral States to lay mines in the high seas and in the territorial waters of neutral states.<sup>182</sup> In response, the UK declared special control measures in an area of the North Sea contiguous with its coast along with laying mines and closing ports on the eastern side of England to neutral fishing vessels. The UK announced any neutral vessel found in the zone would be under suspicion of engaging in the act of laying mines for Germany and would be sunk if found to be in the act.<sup>183</sup> Although these special measures were met by protest from the Netherlands as "an encroachment upon the right of neutral fishermen to exercise in a peaceable manner their trade in the open seas," the UK and Germany continued to lay mines and declare increasingly restrictive and destructive exclusion zones.<sup>184</sup>

Upon further mining by Germany, the UK issued an admiralty notice declaring the whole of the North Sea as a military area and provided notice to all vessels that passage through the designated area would be at their own peril. Instead, the UK provided details for safe passage through a different route that allowed international commerce to continue, but at times required neutral vessels to travel several hundred miles beyond the most direct route to the desired ports. Germany followed suit and established exclusion zones in the waters around Great Britain, France, Italy, and the eastern Mediterranean. Unlike the British zones, Germany declared that "[a]ll ships met within that zone will be sunk."<sup>185</sup> Germany's actions were roundly condemned as violating international law as the standard response to enemy merchant ships at the time "was visit, search, and seizure."<sup>186</sup>

The British and German zones were met with many protests. The Netherlands and US strongly objected to the British zones as unduly impacting their freedom on the high seas.<sup>187</sup> Considering the apparent indiscriminate sinking of merchant ships by Germany, several neutral

<sup>&</sup>lt;sup>182</sup> Sivakumaran, *supra* note 171 at 158. Neutral State is defined as "any State not party to the conflict." *San Remo* Manual, *supra* note 174 at para 13.

 <sup>&</sup>lt;sup>183</sup> James Garner, *International Law and the World War* (New York: Longsman, Green, & Co., 1920) at 329.
<sup>184</sup> *Ibid.*

<sup>&</sup>lt;sup>185</sup> Message from the German Ambassador to the Secretary of State (31 January 1917) reprinted in US Naval War College International Law Studies, *International Law Documents 1943*, vol 43 (Washington, DC: US Naval War College, 1945) at 55, online: <a href="https://www.usnwc.edu/getattachment/a8dd9e0d-792b-4a10-a886-">https://www.usnwc.edu/getattachment/a8dd9e0d-792b-4a10-a886-</a>

cbc5db4fb9a7/Vol—44—International-Law-Documents—1943.aspx>.

<sup>&</sup>lt;sup>186</sup> Sivakumaran, *supra* note 171 at 161.

<sup>&</sup>lt;sup>187</sup> Goldie, *supra* note 176 at 167.

states, including Greece, Italy, the Netherlands, and the US protested its exclusion zone.<sup>188</sup> The strongest rebuke and one reflective of the general outrage amongst neutral states regarding Germany's actions came from US Ambassador to the German Secretary of Foreign Affairs, which reads in part:

It is of course not necessary to remind the German Government that the sole right of a belligerent in dealing with neutral vessels on the high seas is limited to visit and search, unless a blockade is proclaimed and effectively maintained, which this Government does not understand to be proposed in this case. To declare or exercise the right to attack and destroy any vessel entering a prescribed area of the high seas without first certainly determining its belligerent nationality and the contraband character of its cargo would be an act so unprecedented in naval warfare that this Government is reluctant to believe that the Imperial Government of Germany in this case contemplated it as possible. The suspicion that enemy ships are using neutral flags improperly can create no just presumption that all ships traversing a prescribed area are subject to the same suspicion. It is to determine exactly such questions that this Government understands the right of visit and search to have been recognized.<sup>189</sup>

In an apparent admission to the lack of legal support for their actions, Germany described its actions as "new forms of maritime war."<sup>190</sup> It has been argued that Germany's decree establishing so called "free fire zones" were the "chief cause of the outbreak of the war between Germany and various American republics, including the US."<sup>191</sup>

The exclusion zones declared during World War I covered large swaths of the high seas and resulted in the indiscriminate sinking of numerous merchant ships. States consistently objected to the creation of exclusion zones and denounced Germany's attack on neutral merchant ships. Other than Germany and the UK, the international community roundly condemned the zones as unlawful. In an apparent acknowledgement of the illegality of the zones and the lack of justification in existing international law, Germany and the UK justified their actions not by rules of international law, but by pointing to acts of reprisal and the novelty of the situations.

After World War I, exclusion zones remained a practice employed by navies engaged in naval warfare. Two instances where zones were used and resulted in controversial outcomes were during the conflict between the UK and Argentina in 1982 over the Falkland Islands and

<sup>&</sup>lt;sup>188</sup> Ibid.

<sup>&</sup>lt;sup>189</sup> "Note from US Ambassador to Germany to German Secretary of Foreign Affairs" (10 February 1915) reprinted in US Department of State, *Diplomatic Correspondence with Belligerent Governments Relating to Neutral Rights* and Commerce (Washington, DC: Government Printing Office, 1915) at 54.

<sup>&</sup>lt;sup>190</sup> "Letter from the German Minister for Foreign Affairs", reprinted in *Ibid* at 58.

<sup>&</sup>lt;sup>191</sup> Garner, *supra* note 183 at 346.

the Iran and Iraq conflict that began in 1980.<sup>192</sup> The zones created during these conflicts were not "free-fire zones," yet some neutral vessels were attacked inside and outside the declared zones. Unlike the zones in World War I, the sinking of the neutral vessels was justified by the State on a belief that the vessels were supporting the adversary and thus a lawful target, and not targeted simply because the vessel was within the zone. This resulted in protests regarding the targeting of neutral vessels, but there did not appear to be protests regarding the role of the exclusion zone in the sinking.<sup>193</sup> In addition to the protests regarding targeting, the other protests against the exclusion zones were based on infringement on the freedom of the seas.<sup>194</sup>

# 4. Lawfulness of Maritime Exclusion Zones in the Contemporary Environment

As seen in the above sections, zones created on the high seas often coincide with claims of self-defense in a national security context or during actual armed conflict. For those instances where States rely on their inherent right of self-defense or rights as a belligerent in an armed conflict to justify their declaration of a zone, the creation of the zone and actions within the zone must comply with international humanitarian law and the law of naval warfare. The law of naval warfare is a subset of international humanitarian law and is primarily rooted in customary international law.<sup>195</sup> Since no treaty has been concluded with rules specific to naval warfare, a group of legal and naval experts were brought together by the International Institute of Humanitarian Law (IIHL) to determine the *lex lata* of naval warfare. The result of over six years of work by the IIHL is the *San Remo Manual* which is "a contemporary restatement of international law applicable to armed conflicts at sea."<sup>196</sup> One author has noted, "[a]lthough it is an unofficial statement, it is generally regarded as expressive of accepted customary law."<sup>197</sup>

<sup>&</sup>lt;sup>192</sup> Sivakumaran, *supra* note 171 at 177.

<sup>&</sup>lt;sup>193</sup> *Ibid*.

<sup>&</sup>lt;sup>194</sup> Regarding the Argentina and UK conflict: See e.g. Serge Schmemann, "British War Zones Called Unlawful in Soviet Protest", *New York Times* (15 May 1982) (The USSR protested the UK's Total Exclusion Zone as an infringement on high seas freedom.), online: <www.nytimes.com/1982/05/15/world/british-war-zones-calledunlawful-in-soviet-protest.html>; Regarding the Iran and Iraq conflict: See e.g. UNSCOR, 39th Sess, 2546th Mtg, UN Doc S/PV.2546 (1 June 1984) at paras 23, 33, 78, 92 (protests were noted from China, the Netherlands, the UK, and India).

<sup>&</sup>lt;sup>195</sup> Peter Malanczuk, *Akehurst's Modern Introduction to International Law*, 7th ed (London: Routledge, 1997) at 350.

<sup>&</sup>lt;sup>196</sup> San Remo Manual, supra note 174 at 5.

<sup>&</sup>lt;sup>197</sup> Leslie C. Green, *The Contemporary Law of Armed Conflict*, 3rd ed (Manchester, UK: Manchester University Press, 2008) at 45.

The establishment of a zone does not provide valid justification for a belligerent to violate its obligations under international humanitarian law or the law of naval warfare. The belligerent State maintains the customary right to control neutral vessels and aircraft in the immediate vicinity of naval operations. The *San Remo Manual* identified a set of factors to govern naval operations within established zones during a conflict:

- (a) the same body of law applies both inside and outside the zone;
- (b) the extent, location, and duration of the zone and the measures imposed shall not exceed what is strictly required by military necessity and the principles of proportionality;
- (c) due regard shall be given to the rights of neutral States to legitimate uses of the seas;
- (d) necessary safe passage through the zone for neutral vessels and aircraft shall be provided:
  - i. where the geographical extent of the zone significantly impedes free and safe access to the ports and coasts of a neutral State;
  - ii. in other cases where normal navigation routes are affected, except where military requirements do not permit; and
- (e) the commencement, duration, location, and extent of the zone, as well as the restrictions imposed, shall be publicly declared and appropriately notified.<sup>198</sup>

The drafters of the manual recognize that these factors are a progressive view of the law as it relates to zones; however, when these factors are met the State can be confident their behavior complies with their obligations under the law of naval warfare. The Manual provides that "[a] belligerent cannot be absolved of its duties under international humanitarian law by establishing zones which might adversely affect the legitimate uses of defined areas of the sea."<sup>199</sup> This sentence recognizes much of the prior practice in exclusion zones and blots it out by clearly stating that States do not acquire any special or additional rights by virtue of establishing a zone.<sup>200</sup> The Manual separates out the targeting of vessels within the zone and the creation of the zone itself. With the distinction between the creation of the zone and the rights within the zone clearly in focus, consideration can be given to the act of establishing a zone and its lawfulness.

As discussed in earlier sections when examining specific types of zones, the acceptance by other States and the zone's conformity to international law usually depend upon the extent, location, and duration of the zone (due regard). Furthermore, "there must be a proportional and demonstrable nexus between the zone and the measures imposed, including both restrictive and

<sup>&</sup>lt;sup>198</sup> San Remo Manual, supra note 174 at para 106.

<sup>&</sup>lt;sup>199</sup> *Ibid* at para 105.

<sup>&</sup>lt;sup>200</sup> Sivakumaran, *supra* note 171 at 192.

enforcement measures, and the self-defense requirements of the State establishing the zone."<sup>201</sup> Interestingly, the commentary to the Manual proposes a type of zone for illustrative purposes that would be in compliance with current law of naval operations. As noted above, a belligerent cannot acquire additional rights by creating a zone, but a State can abdicate a right outside of the zone. For example, a State may decide to not attack enemy warships outside of a declared zone, but maintain the right to attack within the declared zone.<sup>202</sup> In this way, the declaring State has acquired no additional right, but instead has chosen to exercise their rights restrictively.<sup>203</sup>

When States seek to use additional tools to combat security threats not normally available during times of peace, States often make claims of self-defense and call upon the law of naval warfare for justification. This approach may be defensible, because "in the present world of complex interdependencies...[s]trict adherence to the dichotomy between war and peace would be ineffective and counterproductive for establishing peace and security."<sup>204</sup> The distinction between actions taken to preserve national security justified by self-defense and those actions taken as a belligerent engaged in naval warfare, remain; however, as States continue to exert their naval power more frequently and in closer proximity to other States the lines become blurred. Much like outer space, the seas are dominated by relatively few naval powers who are capable of establishing or deconstructing norms of behavior through persistence and uniform practice. The clear rules for the sea, and likely for outer space, now seem to be that in no circumstance does a State gain additional rights through the creation of a zone. The right of self-defense and the right of a belligerent remain and the State may choose to exercise those rights inside and outside of a respective zone.

# 5. Safety Zones in the Exclusive Economic Zone

The last zone to be considered in this section is codified in Article 60 of UNCLOS and allows coastal States to establish reasonable safety zones around artificial islands, installations, and structures constructed in the State's EEZ.<sup>205</sup> Within the EEZ coastal states have "sovereign

<sup>&</sup>lt;sup>201</sup> *Ibid* at para 106.2.

<sup>&</sup>lt;sup>202</sup> The illustration appears to be based on the early iterations of the UK exclusion zones during the UK and Argentina conflict. For further discussion of the UK and Argentina conflict, see the text accompanying note 180. <sup>203</sup> San Remo Manual, supra note 174 at para 106.1.

<sup>&</sup>lt;sup>204</sup> Dieter Fleck, "Individual and State Responsibility for Intelligence Gathering" (2007) 28:3 Mich J Intl L 687 at 690 (this comment is put forward while differentiating the rules for wartime and peacetime espionage).

<sup>&</sup>lt;sup>205</sup> "The [EEZ] shall not extend beyond 200 nautical miles from the baselines from which the breadth of the territorial sea is measured." UNCLOS, *supra* note 109, art 57.

rights for the purpose of exploring and exploiting, conserving and managing the natural resources.<sup>206</sup> In carrying out these activities the coastal State must have due regard to the rights and duties of other States, particularly the freedom of navigation and overflight.<sup>207</sup> One of the enumerated uses of the EEZ is the establishment and use of artificial islands, installations, and structures. The established zone cannot exceed 500 meters from the outer edges of the artificial island, installation, or structure and must not interfere with recognized sea lanes essential to international navigation. The coastal State must ensure the design of the zone is "reasonably related to the nature and function of the artificial islands, installations, or structure...and due notice shall be given of the extent of the safety zones.<sup>208</sup>

The right of a State to declare a safety zone around artificial islands, installations, and structures in the EEZ, are in contrast with the right of a state to declare a territorial sea around its naturally formed islands. As seen in the recently decided *South China Sea Arbitration*, China is constructing artificial islands in the Philippines' EEZ and claiming a territorial sea and accompanying sovereign rights.<sup>209</sup> The tribunal decided China could not construct artificial islands in the Philippines' EEZ without permission from the Philippines. Furthermore, the tribunal found that only the Philippines could declare a safety zone around an artificial island in its EEZ.<sup>210</sup>

# D. Air Defense Identification Zones

Unlike the centuries' long development of the law of the sea, international air law was codified in the *Convention on International Civil Aviation* (Chicago Convention)<sup>211</sup> early in its development and has an international rule-making body in the UN International Civil Aviation Organization (ICAO). Even though ICAO regularly promulgates Standards and Recommended Practices that act as amendments to the Chicago Convention, the creation of ADIZs have been

<sup>&</sup>lt;sup>206</sup> *Ibid*, art 56.

<sup>&</sup>lt;sup>207</sup> *Ibid.* All States operating in the EEZ enjoy rights provided in Article 87, UNCLOS. *Ibid*, art 58.

<sup>&</sup>lt;sup>208</sup> *Ibid*, art 60.

<sup>&</sup>lt;sup>209</sup> In the Matter of the South China Sea Arbitration (Philippines v China) Award (2016), PCA Case No 2013-19, online: Permanent Court of Arbitration <a href="https://pca-cpa.org/wp-content/uploads/sites/175/2016/07/PH-CN-20160712-Award.pdf">https://pca-cpa.org/wp-content/uploads/sites/175/2016/07/PH-CN-20160712-Award.pdf</a>.

<sup>&</sup>lt;sup>210</sup> *Ibid*, at para 1039.

<sup>&</sup>lt;sup>211</sup> Convention on International Civil Aviation, 7 December 1944, 15 UNTS 295 (entered into force 4 April 1947) [Chicago Convention].

the result of state practice.<sup>212</sup> In fact, there is no explicit rule of international law allowing an ADIZ in international airspace. As a result, the development of international law regarding ADIZs is subject to the arduous process and variances of customary international law. As the law surrounding ADIZs develops it is limited by the guarantee of overflight on the high seas enshrined in UNCLOS, thus no State can make valid claims of sovereignty by way of an ADIZ on the high seas or the airspace above it.

An ADIZ has been defined as, "an area of airspace, adjacent to but beyond the national airspace and territory of the state, where aircraft are identified, monitored, and controlled in the interest of national security."<sup>213</sup> For the purpose of comparison with zones in other environments, it is important to identify common characteristics among the many ADIZs. One author proposes that ADIZs can be reduced to six fundamental elements:

(1) protecting national security; (2) regulating entry into national airspace; (3) administration through aircraft identification and control procedures; (4) application to all aircraft regardless of civil or state character; (5) enforcement through interception; and (6) extensive temporal and geographic scope.<sup>214</sup>

He identifies these six principles from four sources of international law: "state practice, as exemplified by the lead actor, the US; the right of self-defense under customary international law; international aviation law set forth in the Chicago Convention; and international maritime law set forth in UNCLOS."<sup>215</sup> As will be discussed below, the vast majority of ADIZs reflect these six principles.

# 1. The Traditional View of ADIZs as Modeled after the United States

The law governing ADIZs as shown in the six elements identified above largely result from extensive state practice from over twenty States<sup>216</sup> modeled after US practice and

<sup>&</sup>lt;sup>212</sup> At times, States have asserted rights under the Chicago Convention to create conditions and procedures for entry into national airspace as a legal basis for ADIZs. Austl Defence Department, Defence Doctrine Publication, Executive Series: Law of Armed Conflict (ADDP 06.4) (11 May 2006) at para 8.23.

<sup>&</sup>lt;sup>213</sup> Roncevert Almond, "Clearing the Air Above the East China Sea: the Primary Elements of Aircraft Defense Identification Zones" (2015) 7:1 Harv Natl Sec J 126 at 129, n1; See e.g. US Federal Aviation Administration, Aeronautics and Space Definitions, 14 CFR § 99.3 (2015) (defining ADIZ) [FAA Definitions]. <sup>214</sup> Almond, *Ibid*; See e.g. FAA Definitions, *Ibid*.

<sup>&</sup>lt;sup>215</sup> Almond, *Ibid*.

<sup>&</sup>lt;sup>216</sup> See generally US-China Economic and Security Review Commission, "Air Defense Identification Zone Intended to Provide China Greater Flexibility to Enforce East China Sea Claims" (2014), online: <www.uscc.gov/sites/default/files/Research/China%20ADIZ%20Staff%20Report.PDF>.

policies,<sup>217</sup> with one notable exception – China, which will be discussed below. Because ADIZs are rooted in customary international law which derives from uniform and persistent state practice among states and opinio juris, as shown by States' belief that they are bound by the law in question, the formation of law is subject to countervailing State action.<sup>218</sup> Before 2013, no State had formally objected to the creation or operation of ADIZs as a violation of international law and ADIZs were generally viewed to be allowed by customary international law.<sup>219</sup>

The overriding purpose of ADIZs is to protect national security. States rely on the inherent right of all States to exercise self-defense in customary international law and as provided in the Charter of the United Nations (Charter).<sup>220</sup> The first ADIZ established by the US in the early 1950s was in response to the threat of long-range bombers from the USSR.<sup>221</sup> Soon after creating an ADIZ around North America, to include Canada, the US created an ADIZ for Japan and South Korea.<sup>222</sup> The national legal authority for the US ADIZ is found in The Federal Aviation Act of 1958<sup>223</sup> which created the Federal Aviation Authority (FAA) and vested its administrator with the power to "prescribe air traffic regulations" for "navigating, protecting, and identifying aircraft" and "using the navigable airspace efficiently."<sup>224</sup> Later, the FAA published Security Control of Air Traffic, 14 CFR Part 99, which firmly rooted the goal of the ADIZ in national security.<sup>225</sup>

The exclusive sovereignty of a State ends at the outer edge of the territorial sea,<sup>226</sup> which operates as a security buffer for States to interdict vessels and aircraft that may do the coastal

<sup>&</sup>lt;sup>217</sup> Ruwantissa Abevratne, "In Search of a Theoretical Justification for Air Defense Identification Zones" (2012) 5:1 J Transp Sec 87 at 90.

<sup>&</sup>lt;sup>218</sup> Military and Paramilitary Activities in and Against Nicaragua (Nicaragua v US), Merits Judgment [1986] ICJ Rep 14 at s 184 [Nicaragua].

<sup>&</sup>lt;sup>219</sup>See Abevratne, *supra* note 217; But see Christopher Petras, "The Law of Air Mobility: The International Legal Principles Behind the U.S. Mobility Air Forces Mission" (2010) 66:1 AFL Rev 1 at 63 (observes there is not international consensus on whether a legal basis for ADIZs exists in the Chicago Convention.).

<sup>&</sup>lt;sup>220</sup> Charter of the United Nations, 26 June 1945, Can TS 1945 No 7, art 51 [Charter].

<sup>&</sup>lt;sup>221</sup> Chrisopher K. Lamont, "Conflict in the Skies: The Law of Air Defence Identification Zones" (2014) 39:3 Air & Sp L 187 at 197-98. <sup>222</sup> *Ibid*.

<sup>&</sup>lt;sup>223</sup> *The Federal Aviation Act of 1958*, Pub L No 85-726, 72 Stat 731.

<sup>&</sup>lt;sup>224</sup> Sovereigntv and Use of Airspace, 49 USC § 40103(b)(2).

<sup>&</sup>lt;sup>225</sup> The FAA cites the following provisions from the Federal Aviation Act to support Part 99: 49 USC §106(g)

<sup>(1994), 40101, 40103, 40106, 40133, 40120, 44502, 44721.</sup> Security Control of Air Traffic, 14 CFR Part 99 (2015). <sup>226</sup> "The basic legal concept of State sovereignty in customary international law, expressed in, inter alia, Article 2, paragraph 1, of the UN Charter, extends to the internal waters and territorial sea of every State and to the air space above its territory." Nicaragua, supra note 218 at s 212.

State harm.<sup>227</sup> Unlike the law of the sea, international air law does not grant innocent passage in the airspace over the territorial waters.<sup>228</sup> As such, the coastal state decides whether to grant or deny access to its national airspace<sup>229</sup> and the ADIZ serves as an area to regulate entry into national airspace. Whereas States cannot lawfully exert sovereignty over international airspace, only aircraft departing, operating within, or entering national airspace are subject to the ADIZ.<sup>230</sup> As a result, ADIZs modeled after the US provide the coastal State with information about approaching aircraft, so the coastal State can exercise law enforcement powers in national airspace more timely.

# 2. ADIZ as a Means of Asserting Sovereignty: The East China Sea ADIZ

The approach to ADIZs changed when China declared its ADIZ over the East China Sea (ECS ADIZ) through a public announcement on 23 November 2013. The ECS ADIZ came into force just hours after being announced without any prior coordination with the international community.<sup>231</sup> Within the ECS ADIZ China requires all aircraft, civil or state, to adhere to the published requirements. Unlike other States, China makes no distinction between aircraft simply traversing international airspace with no intention of entering Chinese airspace and those aircraft departing, operating within, and entering Chinese airspace.<sup>232</sup> According to the Chinese Defense Ministry, China may use "defensive emergency measures" against any uncooperative aircraft. China has also warned that it may create an ADIZ above the vast waters of the South China Sea. In this way the ESC ADIZ may be China's first attempt in establishing a new state practice "in

<sup>230</sup> Applicability of ADIZ, 14 CFR § 99.1(a) ("into, within, or out of the US through an Air Defense Zone").
<sup>231</sup> Chinese Ministry of National Defense, Public Announcement, "Announcement of the Aircraft Identification

Rules for the East China Sea Air Defense Identification Zone of the People's Republic of China" (23 November 2013), online: Official News Agency of the People's Republic of China – Xinhuanet

<http://news.xinhuanet.com/english/china/2013-11/23/c\_132911634.htm>.

<sup>&</sup>lt;sup>227</sup> The original three-mile territorial sea was established in response to the maximum range of a cannon ball. Over time this came to be known as the "cannon-shot rule." See Daniel-Erasmus Khan, "Territory and Boundaries", in Bardo Fassbender, et al, eds, *The Oxford Handbook of the History of International Law*, (Oxford: Oxford University Press, 2012) at 241 citing US Secretary of State Thomas Jefferson's 8 November 1793 letter.

<sup>&</sup>lt;sup>228</sup> See *Navy Handbook*, supra note 142 at ss 1.3.2, 2.7.1.

<sup>&</sup>lt;sup>229</sup> Chicago Convention, supra note 211, art 11.

<sup>&</sup>lt;sup>232</sup> US Department of Defense, Asia-Pacific Maritime Security Strategy: Achieving U.S. National Security Objectives in a Changing Environment (14 Aug 2015) at 31, online:

<sup>&</sup>lt;www.defense.gov/Portals/1/Documents/pubs/NDAA%20A-P\_Maritime\_Security\_Strategy-08142015-1300-FINALFORMAT.PDF> ("China professed to apply [the ADIZ] even to aircraft not intending to enter Chinese national airspace." at 31).

which ADIZs are used for a prescriptive purpose: for the administration and effective occupation of disputed territory."<sup>233</sup>

Many States have publicly objected to the ECS ADIZ as an infringement on the freedom of overflight in international airspace<sup>234</sup> and the US, in addition to publicly objecting, refused to modify its practice of flying military aircraft routinely through other State's ADIZs without providing identification or flight information.<sup>235</sup> Without question, China's ESC ADIZ goes beyond the acceptable norms for ADIZs. The distinction can be found in China's assertion of defacto sovereignty rights over international airspace. Other States condition entry into national airspace upon adherence with the ADIZ regulations, while China attempts to require compliance from all aircraft flying through the ADIZ whether or not the aircraft intends or has signaled an intent to enter Chinese airspace. This distinction reinforces the principle found in the different zones established on the high seas. That is a State gains no additional rights by declaring or establishing a zone, and the high seas and adjoining international airspace are not subject to the sovereignty of any state.

#### Consideration of Zones in Cyberspace E.

Unlike the sea and airspace, cyberspace is not a clearly defined, physical environment. Instead it is a multilayered and multi-dimensional environment, wholly created by man, that includes the Internet.<sup>236</sup> In an off-cited article, Yochai Benkler explains that cyberspace is made

<www.foreignminister.gov.au/release/2013/jb mr 131126a.html>; UK Embassy Tokyo, News Release, "European Union declaration on the establishment by China of an 'East China Sea Air Defence Identification Zone''' (28 November 2013) (EU opposes ECS ADIZ as a violation of international law) online:

<https://www.gov.uk/government/world-location-news/eu-declaration-on-east-china-sea-air-defence-identificationzone>.; Ministry of Foreign Affairs of Japan, Press Release, "Statement by the Minister of Foreign Affairs on the announcement of the 'East China Sea Air Defense Identification Zone' by the Ministry of National Defense of the People's Republic of China" (24 November 2013) (Japan asserted that the ESC ADIZ "unduly infringe[s] the freedom of flight in international airspace, which is the general principle of international law.") online: <www.mofa.go.jp/press/release/press4e 000098.html>; Association of Southeast Nations (ASEAN) also issued a statement in conjunction with Japan condemning the ESC ADIZ. ASEAN member States are: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. Association of Southeast Asian Nations, "Joint Statement of the ASEAN-Japan Commemorative Summit 'Hand in hand, facing regional and global challenges''' (15 December 2013), online: <http://mofa.go.jp/files/000022451.pdf>. <sup>235</sup> Navy Handbook, supra note 142 at s 2.7.2.3.

<sup>&</sup>lt;sup>233</sup> Almond, *supra* note 213 at 129, n1.

<sup>&</sup>lt;sup>234</sup> See Australian Ministry of Foreign Affairs, News Release, "China's announcement of an air-defense identification zone over the East China Sea" (26 November 2013) (Australia opposes any "coercive or unilateral actions" to change status quo in East China Sea) online:

<sup>&</sup>lt;sup>236</sup> The Oxford English Dictionary defines "Internet" as: "the global computer network (which evolved out of ARPAnet) providing a variety of information and communication facilities to its users, and consisting of a loose confederation of interconnected networks which use standardized communication protocols; (also) the information

up of three layers: "the physical infrastructure layer," the "logical infrastructure layer," and "the content layer."<sup>237</sup> There is no demarcation between these different layers, and the term cyberspace can refer to any of the layers individually or collectively. The US government has defined cyberspace as "the interdependent network of information technology infrastructures," which "includes the Internet, telecommunications networks, computer systems, and embedded processors and controllers in critical industries."<sup>238</sup>

Despite the complexities of clearly defining the cyberspace environment, there is a general consensus among States that cyberspace is a separate domain and should be on equal footing with the ground, sea, and air domains.<sup>239</sup> Beyond agreeing that cyberspace is a distinct domain with its own governance challenges, States do not agree on much else. Some States advocate that cyberspace is a sovereign unto itself and cannot be subject to the traditional sense of territorial sovereignty currently exercised by States, but the prevailing view is that cyberspace is subject to the sovereign control of States.<sup>240</sup> This governance comes through control of the physical assets used to support cyberspace and the people who work to maintain and create software and content who are subjects of a particular State or located in a State.<sup>241</sup> The issue of cyberspace governance is now dominated by intergovernmental relations and the lack of a "founding international constitutional moment"<sup>242</sup> has brought about a situation where "the US, China, and Europe are using their coercive powers to establish different visions of what the

available on this network." Oxford English Dictionary Online, "Internet" (June 2016), online:

<sup>&</sup>lt;www.oed.com/view/Entry/248411?isAdvanced=false&result=1&rskey=VCqLVq&>; It defines cyberspace as: "[t]he space of virtual reality; the notional environment within which electronic communication (especially via the Internet) occurs." Oxford English Dictionary Online, June 2016, sub verbo "cyberspace", online: <www.oed.com/view/Entry/240849?redirectedFrom=cyberspace#eid>.

<sup>&</sup>lt;sup>237</sup> Yochai Benkler, "From Consumer to Users: Shifting the Deeper Structures of Regulation Toward Sustainable commons and User Access" (2000) 52:3 Fed Comm LJ 561 at 562; But see Lawrence B. Solum & Minn Chung, "The Layers Principle: Internet Architecture and the Law" (2004) 79:3 Notre Dame L Rev 815 at 816-17 (proposing the Internet is made up of six layers, instead of three).

<sup>&</sup>lt;sup>238</sup> US, White House, *Cyberspace Policy Review* (2009), (noting this definition is included in National Security Presidential Directive 54 and Homeland Security Presidential Directive 23), online:

<sup>&</sup>lt;www.whitehouse.gov/assets/documents/Cyberspace\_Policy\_Review\_final.pdf>.

<sup>&</sup>lt;sup>239</sup> Kristen E. Eichensehr, "The Cyber-Law of Nations" (2014-15) 103:1 Geo LJ 317 at 330.; but see Patrick W. Franzese, "Sovereignty in Cyberspace: Can It Exist?" (2009) 64 AFLR 1 at 32 (noting that although the US 2006 *National Military Strategy for Cyberspace Operation* declares cyber as a separate domain, not all officials within the US DoD believe cyber constitutes a separate domain).

<sup>&</sup>lt;sup>240</sup> Franzese, *supra* note 239 at 10-12.

<sup>&</sup>lt;sup>241</sup> Eichensehr, *supra* note 239 at 338.

<sup>&</sup>lt;sup>242</sup> Lawrence Lessig, *Code: Version 2.0* (New York: Basic Books, 2006) at 302.

Internet might be[,]...[and] will attract other nations to choose among models of control ranging from the US's relatively free and open model to China's model of political control."<sup>243</sup>

The differing views of cyberspace governance have resulted in a two-bloc system with the US and Western Europe with its allies on one side, and China and Russia with its allies on the other side. The US and Western Europe support a multi-stakeholder approach where governance is achieved through collaboration between governments, nongovernmental organizations, the private sector, civil society, academia, and individuals.<sup>244</sup> The US International Strategy for Cyberspace charges the US government to "[p]romote and enhance multi-stakeholder venues for the discussion of Internet governance issues"<sup>245</sup> Similarly, the European Union promotes the "present bottom-up, multi-stakeholder model" and "believes that internet governance and related regulatory issues should continue to be defined at a comprehensive and multi-stakeholder level."<sup>246</sup> Conversely, Russia, China, and their allies seek to establish a sovereign-based regime of Internet governance that covers both domestic and international. The domestic governance would give States the right to limit the content available in their countries and the international governance would be transferred to the International Telecommunications Union (ITU).<sup>247</sup> The lack of consistency in cyber governance fosters instability and increases the chance for conflict.

It is in this realm of potential conflict that States would consider establishing safety and security zones in cyberspace. The acknowledgement of cyber as a domain for warfare has led

<sup>&</sup>lt;sup>243</sup> Jack Goldsmith & Tim Wu, *Who Controls the Internet?: Illusions of a Borderless World* (Oxford: Oxford University Press, 2006) at 184.

<sup>&</sup>lt;sup>244</sup> Eichensehr, *supra* note 239 at 330.

<sup>&</sup>lt;sup>245</sup> US White House, *International Strategy for Cyberspace Prosperity, Security, and Openness in a Networked World* (2011), online:

<sup>&</sup>lt;www.whitehouse.gov/sites//default/files/rss\_viewer/international\_strategy\_for\_cyberspace.pdf>.

<sup>&</sup>lt;sup>246</sup> European Parliament Resolution on the Forthcoming World Conference on International Telecommunications (WCIT-12) of the International Telecommunications Union and the Possible Expansion of the Scope of International Telecommunication Regulations, Eur Parl Doc P7\_TA (2012)0451 § 5.

<sup>&</sup>lt;sup>247</sup> Eichensehr, *supra* note 239 at 331. In 2012, at the World Conference on International Telecommunications, Russia proposed a revision to the ITU International Telecommunications Regulations that would give the ITU control over particular aspects of the Internet. The final resolution, which was signed by 89 States, reads that "all governments should have an equal role and responsibility for international Internet governance and for ensuring the stability, security and continuity of the existing Internet and its future development." Included in the nonsignatories were the US, Canada, Western European countries, Australia, New Zealand, and India. World Conference on International Telecommunications, Dubai, UAE, (3-14 December 2012), Final Acts of the World Conference on International Telecommunications, at Resolution Plen/3, §§e, 1. See International Telecommunications Union "Signatories of the Final Acts: 89," online: <<www.itu.int/osg/wcit-12/highlights/signatories.html>.

States to develop strategic guidance for its militaries on how to operate in cyberspace.<sup>248</sup> In recognition of the absence of clear rules of armed conflict or use of force in cyberspace, a group of international experts came together and endeavored to "bring some degree of clarity to the complex legal issues surrounding cyber operations."<sup>249</sup> This group of experts produced the *Tallinn Manual*. In considering the role of safety and security zones in cyberspace, the group of experts concluded that technically defining a zone in cyberspace was nearly impossible and as a result, it would be inappropriate to fashion rules to cover the use of zones.<sup>250</sup> The group of experts did consider the use of cyberspace to support zones established in other environments. Rule 69 of the *Tallinn Manual* states, "To the extent that States establish zones, whether in peacetime or during armed conflict, lawful cyber operations may be used to exercise their rights in such zones."<sup>251</sup>

The use of zones, if technically feasible, would be lawful in cyberspace during a time of armed conflict as long as the belligerents complied with the law of armed conflict in carrying out operations in the zone. If there is no ongoing conflict, "international law regarding self-defense and force protection applies fully within such zones."<sup>252</sup> The ambiguity of governance and the lack of demarcations for national sovereignty in the multi-layered cyberspace present significant challenges to States in deciding when an armed conflict has started or is anticipated.

#### Conclusion

The establishment of zones in the sea and air environments provide a framework by which to consider zones in outer space. First, the zone must be transparent to all users in establishment and operation. Whether a zone is being created to safeguard sensitive military operations, protect national security, distinguish hostile intent, or provide safety to structures in the EEZ, the parameters must be communicated with sufficient detail for others to respond accordingly. The second principle is States cannot not acquire sovereign rights over the zone.

<sup>&</sup>lt;sup>248</sup> See US, Department of Defense, *Strategy for Operating in Cyberspace* (2011); Canada, Government of Canada, *Canada's Cyber Security Strategy* (October 2011); UK, *The UK Cyber Security Strategy: Protecting and Promoting the UK in a Digitized World* (2011); Russian Federation, *Conceptual Views Regarding the Activities of the Armed Forces of the Russian Federation in Information Space* (2011).

<sup>&</sup>lt;sup>249</sup> Tallinn Manual, supra note 110 at 3.

<sup>&</sup>lt;sup>250</sup> *Ibid* at 199-200.

<sup>&</sup>lt;sup>251</sup> *Ibid* at 202.

<sup>&</sup>lt;sup>252</sup> *Ibid* at 199, n 270.

Finally, the law that applies outside the zone, also applies inside the zone. As a result, if the zone is established on the high seas or in adjacent international airspace, the State that established the zone does not possess policing authority and compliance with the zone parameters by other States is dependent on voluntariness and comity.

It is in this identification of common principles that make zones lawful at sea and in the air, and will support the assertion that safety and security zones are lawful in outer space.

# Chapter III Safety & Security Zones in Outer Space

This chapter will demonstrate that safety and security zones are compatible with international space law. The norms identified from the varying zone constructs examined in Chapters 1 and 2 show that the creation and maintenance of zones varies based on the mission and environment. As a result, the identified norms are broad and overarching and reflect the foundational principles of free access, common interest, and freedom of exploration and use that can be found in the law of the sea, international air law, and the law of outer space. The three overarching norms identified in Chapters 1 and 2 that will frame the argument and serve as the foundation for safety and security zones in outer space are:

- Transparency through the communication of zone parameters;
- No sovereign rights through creation or operation of a zone; and
- The law that applies outside the zone also applies inside the zone.

These norms may seem counterintuitive to the establishment of zones meant to provide safety and security, but the goal of lawfully recognized zones is to achieve safety and security through elimination of ambiguity and clarification of motive.<sup>253</sup> If established according to the principles above, safety and security zones are not only allowed under international space law, but supported by it. The role safety and security zones play in space security, if any, has yet to be determined, but it is important to consider the legal implications before such time comes.

# A. Space Security

When zones were first contemplated in outer space during the Cold War, security was understood to be threats toward States by armed forces of other States, which were primarily the USSR and US.<sup>254</sup> There was little consideration for civilian and commercial interests and as such, the proposals were only concerned with preserving military assets in outer space. The understanding of space security has evolved and was recently defined as "[t]he secure and

 <sup>&</sup>lt;sup>253</sup> Safety and security zones have also been discussed as a useful Transparency and Confidence Building Measure (TCBM) in outer space. Hays, *supra* note 108 at 76.
<sup>254</sup> Michael Sheehan, "Defining Space Security" in Kai-Uwe Schrogl, ed, *Handbook of Space Security: Policies*,

<sup>&</sup>lt;sup>234</sup> Michael Sheehan, "Defining Space Security" in Kai-Uwe Schrogl, ed, *Handbook of Space Security: Policies, Applications and Programs* (New York: Springer, 2015) at 8.

sustainable access to, and use of, space and freedoms from space-based threats."<sup>255</sup> With the purpose of safety and security zones being to provide some level of transparency and reduction in the potential for miscalculation, the security of all space users would be increased. As introduced in Chapter 1, RPO conducted by highly maneuverable, dual-purposed, small satellites presents an emerging security risk that could be mitigated by safety and security zones.

A discussion of space security is important for this chapter and entire thesis, because the argument is underpinned by the potential role of safety and security zones in sustaining access to and use of outer space, even when unilaterally declared. This is in contrast to, or at least different than, establishing or justifying safety and security zones through the "space power" lenses. Such a purpose would be to use safety and security zones to enhance "the ability of a state or non-state actor to achieve its goals and objectives in the presence of other actors on the world stage through control and exploitation of the space environment."<sup>256</sup> Space power is more akin to securitization of space as discussed in Chapter 2,<sup>257</sup> because when States feel threatened, there is a tendency to assert additional rights that infringe on the rights of others in order to protect their interests. Lawful safety and security zones potentially have a role in space security, but zones created to control the space environment for one State to the detriment of other states could escalate potential conflicts. Ultimately, space security is a balance of each State's free access to outer space and the common interests of all States to sustain outer space. The law of outer space, with the Outer Space Treaty as its foundation, attempts to achieve this balance.

## B. International Law of Outer Space Governs

The signing of the Outer Space Treaty capped a decade of entering and exploring outer space and celestial bodies<sup>258</sup> and was the first of five multilateral United Nations (UN) treaties<sup>259</sup>

<sup>&</sup>lt;sup>255</sup> Anna Jaikaran, 2015 Space Security Index (Waterloo, ON: Project Ploughshares, 2015) at 5.

<sup>&</sup>lt;sup>256</sup> James L. Hyatt, et al, "Space Power 2010" (1995) [unpublished], online: <a href="https://fas.org/spp/eprint/95-010e.pdf">https://fas.org/spp/eprint/95-010e.pdf</a>>.

<sup>&</sup>lt;sup>257</sup> See Part II-B, *above*, for more on security in international relations.

<sup>&</sup>lt;sup>258</sup> The milestone events were the launch of Sputnik I in 1957, *Vostok 1* mission with Yuri Gagarin in 1961, and shortly after the treaty in 1969 *Apollo 11* landed on the moon. See, Stephen Doyle, "A Concise History of Space Law: 1910-2009" (Nandasiri Jasentuliyana Keynote Address on Space Law delivered at the Proceedings of the 53rd Colloquium on the Law of Outer Space, France, 2010), 53 Proc Intl Inst Sp L 3.

<sup>&</sup>lt;sup>259</sup> Outer Space Treaty, supra note 14; Convention on International Liability for Damage Caused by Space Objects, 29 March 1972, 24 UST 2389, 961 UNTS 187 (entered into force 1 September 1972) [Liability Convention]; Convention on Registration of Objects Launched into Outer Space, 14 January 1975, 28 UST 695, 1023 UNTS 15 (entered into force 15 September 1976) [Registration Convention]; Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, 18 December 1979, 1363 UNTS 3 (entered into force 11 July 1984); The

that derived from the UN Committee on the Peaceful Uses of Outer Space (COPUOS). The Outer Space Treaty provides the foundational principles for international relations regarding space activities, and the subsequent agreements expand on specific provisions regarding liability, rescue and return of astronauts and space objects, the registration of space objects, and governance of human activity on the Moon and other celestial bodies.

Even though early commentators questioned the applicability of general principles of international law to outer space, including the prohibition on the use of force and the corollary right to self-defense,<sup>260</sup> it is generally accepted today that such principles apply.<sup>261</sup> Article III of the Outer Space Treaty directly imports general principles of international law and the UN Charter into outer space for the purpose of maintaining peace and security.<sup>262</sup> However, the application of the general principles, which set norms and standards for the international relations, to outer space is not without limit.<sup>263</sup> Only relevant principles of international law are applicable, because some principles of international law are *lex specialis* for a particular environment and do not comport with the unique legal principles laid down in the Outer Space Treaty.<sup>264</sup>

To determine the lawfulness of safety and security zones in outer space, it must be clear where such zones would be established and the applicable legal regime. As this thesis considers the lawfulness of safety and security zones surrounding space objects in outer space, the legal regime is international space law. It was established in Chapter 2 that airspace above a State's territory and territorial waters is subject to that State's sovereignty.<sup>265</sup> Outer space begins where

Agreement on the Rescue of Astronauts and the Return of Objects Launched into Outer Space, 22 April 1968, 19 UST 7570, 672 UNTS 119 (entered into force 3 December 1968).

<sup>&</sup>lt;sup>260</sup> See e.g. Sudhaker Chandrasekharan, "The Space Treaty" (1967) 7 Indian J Intl L 61 at 63; Rene H. Mankiewicz, "Some Thoughts on Law and Public Order in Space" (1964) Can YB Intl Law 258 at 267 ("There is little doubt that not much can be drawn from traditional international law and institutions in order to ensure the efficient prevention of unlawful space activities." at 267).

<sup>&</sup>lt;sup>261</sup> Jackson Nyamuya Maogoto & Steven Freeland, "Space Weaponization and the UN Charter Regime on Force: A Thick Legal Fog or a Receding Mist?" (2007) 41 Intl Lawyer 1091 at 1098.

<sup>&</sup>lt;sup>262</sup> Article III reads: "States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the moon and other celestial bodies, in accordance with international law, including the Charter of the UN, in the interest of maintaining international peace and security and promoting international co-operation and understanding." Outer Space Treaty, supra note 14.

<sup>&</sup>lt;sup>263</sup> Cestmir Cepelka & Jamie H. Gilmour, "The Application of General International Law in Outer Space" (1970) 36 Air L & Comm 30 at 33.

 <sup>&</sup>lt;sup>264</sup> Christopher M. Petras, "Space Force Alpha' Military Use of the International Space Station and the Concept of 'Peaceful Purposes" (2002) 53 AFL Rev 135 at 155-56.
<sup>265</sup> See Part III-D, *above*, for more on international air law and ADIZs; *Chicago Convention, supra* note 211, art 1.

airspace ends, and so does the international space law regime.<sup>266</sup> Even though the issue of demarcation between airspace and outer space is not settled and receives considerable academic attention, the point at which orbital passage is possible will serve as the starting point for outer space in this thesis.<sup>267</sup> There is no vertical or spatial limit to the applicability of the law of outer space beyond airspace,<sup>268</sup> thus the law that applies in one area of outer space regarding safety and security zones, applies to all areas.

Next, safety and security zones will be considered as a designated area surrounding space objects. The UN outer space treaties do not definitively define "space object," but according to Articles VII and VIII of the Outer Space Treaty, "an object launched into outer space" and their component parts remain under the jurisdiction and control of the State of registry. Article 1 of the Liability Convention states that a space object "includes component parts of a space object as well as its launch vehicle and parts thereof."<sup>269</sup> Professor Bin Cheng deduces that the term space object describes:

Any object which humans launch, attempt to launch or have launched into outer space. It embraces satellites, spacecraft, space vehicles, equipment, facilities, stations, installations and other constructions, including their component parts, as well as their launch vehicles and parts thereof.<sup>270</sup>

According to Cheng's definition and the partial definitions found in the treaties, a space object is any man-made object launched into outer space. For the purpose of determining the lawfulness of a safety and security zone surrounding a space object, the foregoing analysis will be

<sup>&</sup>lt;sup>266</sup> Bin Cheng, *Studies in International Law* (Oxford: Clarendon Press, 1997) at 18.

<sup>&</sup>lt;sup>267</sup> See Matthew T. King, Sovereignty's Gray Area: The Delimitation of Air and Space in the Context of Aerospace Vehicles and the Use of Force (LLM Thesis, McGill University Institute of Air and Space Law, 2015) [unpublished] at 81 ("There is a dearth of evidence to contradict the assertion of orbit as the line of demarcation between air and outer space, as it pertains to sovereignty." at 81). <sup>268</sup> Lachs, *supra* note 115 at 53 ("One may safely postulate that the realm of the law of outer space extends to

infinity.").

<sup>&</sup>lt;sup>269</sup> Liability Convention, supra note 259, art 1(d).

<sup>&</sup>lt;sup>270</sup> Cheng, *supra* note 266 at 464 (text reproduced from an article written by Cheng in 1989). See e.g. [Belgium] *Law* of 17 September 2005 on the Activities of Launching, Flight Operation or Guidance of Space Objects, as amended by Law of 1 December 2013 (B.O.J. of 15 January 2014) (www.belspo.be/belspo/space/doc/beLaw/Loi en.pdf) at art 3(1) ("space object' means...any object launched or intended to be launched, on an orbital trajectory around the Earth or to a destination beyond the earth orbit."); [Australia] Space Activities Act 1998, s 8, as amended by Act No 8 of 2010 ("space object' means a thing consisting of: (a) a launch vehicle; and (b) a payload (if any) that the launch vehicle is to carry into or back from an area beyond the distance of 100 km above mean sea level; or any party of such a thing, even if: (c) the part is to go only some of the way towards or back from an area beyond the distance of 100 km above mean sea level; or (d) the part results from the separation of a payload or payloads from a launch vehicle after launch.").

applicable for any object launched into outer space, whether it is in orbit around the Earth, on the Moon, or other celestial body.

### C. Establishment and Operation of Zone Must Be Transparent

The law of outer space requires transparency in space activities, but individual States decide the degree of transparency they provide. As a result of many outer space activities being military in nature and related to national security, States are apprehensive to disclose sensitive operating information. Yet, as observed in Chapter 2, zones must be clearly communicated to all potentially affected users to achieve the goals of reducing unintended confrontations and ensuring safe operations. To put it more succinctly, transparency breeds transparency.

Transparency represents the most complicated norm to transpose from other domains to outer space. Most space assets represent years of research and development that have strategic and economic value for a State or commercial entity.<sup>271</sup> The potential benefits of announcing a safety and security zone may be offset by the identification of a critical asset that may not have been of interest to an adversary before creation of the zone. History shows that States provide transparency and engage in cooperation when they believe it serves a national interest, because States are driven by a "need to protect oneself, dominate others, or both."<sup>272</sup> Considering the expected advancement in RPO technologies in the coming years and decades, it can be assumed that interactions such as the Luch-Intelsat will become more commonplace. Not merely the uncoordinated behavior, but activity deemed to impact the "safety of flight" will challenge the safety provided by the current SSA and lack of STM. Then, States may decide that a safety and security zone and its required transparency are useful.

# 1. Article IX of the Outer Space Treaty Requires Transparency

Unlike the elaborate traffic management systems on the sea and in the air, outer space operates largely as a "see and be seen" system.<sup>273</sup> States have an obligation to notify other States

<sup>&</sup>lt;sup>271</sup> Simonetta Cheli, "Cooperation in Space" in Christian Brünner & Alexander Soucek, eds, *Outer Space in Society, Politics, and Law* (New York: SpringerWienNewYork, 2011) at 180.

<sup>&</sup>lt;sup>272</sup> *Ibid*.

<sup>&</sup>lt;sup>273</sup> Larsen, *supra* note 66 at 346.

of potential negative impacts created by zone parameters or the underlying space activity prompting the zone declaration. Article IX of the Outer Space Treaty, in part, requires:

If a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space, including the moon and other celestial bodies, would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, including the moon and other celestial bodies, it shall undertake appropriate international consultations before proceeding with any such activity or experiment.<sup>274</sup>

This provision places a subjective obligation on the State establishing the zone and should be understood as advancing the principles of cooperation and mutual assistance.<sup>275</sup> The State must first determine its zone will cause harmful interference with the activities of another State before the consultation obligation arises. The choice of words in Article IX must be viewed as a deliberate attempt by the drafters to avoid an absolute obligation to engage in consultation regarding their space activities.<sup>276</sup> Additionally, if another State believes that a declared zone creates harmful interference with its space activities or experiments, it may request consultation with the State who declared the zone.<sup>277</sup> As will be discussed in the following section, the consultation requirement is connected to the due regard requirement also found in Article IX of the Outer Space Treaty.

The lack of a clear obligation to engage in consultation is the result of a dispute between the US and USSR during the drafting of the treaty. The US sought to have the ICJ vested with obligatory jurisdiction over disputes arising under the Outer Space Treaty. The USSR soundly rejected this call and instead demanded that disputes be settled through direct negotiation.<sup>278</sup> The Japanese and Lebanese delegations were concerned about the effectiveness of this provision and the Japanese delegation attempted to amend the proposed Article IX with language that would demand prior notification to the UN Secretary-General of any activity that would potentially cause harmful interference.<sup>279</sup> The USSR believed that its proposal, and the eventual text of

<sup>&</sup>lt;sup>274</sup> Outer Space Treaty, supra note 14, art 9.

<sup>&</sup>lt;sup>275</sup> Ibid.

<sup>&</sup>lt;sup>276</sup> Vladimir Kopal, "Origins of space law and the role of the United Nations" in Brünner, *supra* note 271, at 228.

<sup>&</sup>lt;sup>277</sup> Outer Space Treaty, supra note 14, art 9.

<sup>&</sup>lt;sup>278</sup> Cheng, *supra* note 266 at 270.

<sup>&</sup>lt;sup>279</sup> UNCOPOUS, Consideration of a treaty governing the exploration and use of outer space, the moon and other celestial bodies, (26 July 1966) A/AC.105/C.2/SR.68 at 5-6 [Consideration of a Treaty].

Article IX, already required States to provide advance notification to the State that harmful interference may befall, if not to the UN Secretary-General as well.<sup>280</sup>

State practice shows there is no clear consensus on the consultation provision in Article IX as shown by ASAT tests conducted by China and the US. In 2007, China intentionally destroyed its Fengyun-IC weather satellite with an interceptor mounted on a two-stage ballistic missile.<sup>281</sup> Just prior to the explosion, the JSpOC was tracking approximately 14,000 pieces of debris and immediately following the collision the number rose to 15,000 pieces of debris 4cm or larger and increased the collision risk of about 700 spacecraft.<sup>282</sup> One calculation suggest the debris could remain in orbit over 100 years. China did not announce its launch or expected mission, but it is widely assumed the mission was an ASAT test. China's failure to provide an announcement was especially troubling, because it had been an active participant in the Inter-Agency Space Debris Coordination Committee where there were "increased international exchanges on space debris research."<sup>283</sup> This is in contrast to the shoot down of USA-193 by the US Navy in 2008. A newly launched satellite stopped working one day after reaching orbit and was expected to crash with highly toxic hydrazine fuel on board. In an obvious attempt to avoid the public condemnation that China received the year prior, the US announced the launch and its justification prior to carrying out the mission and even engaged in media interviews explaining the mission.<sup>284</sup> The Chinese and US tests were not strictly unlawful as there is no ban on ASATs in outer space;<sup>285</sup> however, China's failure to consult with other States or provide notice of its launch so other States could seek consultation was a violation of Article IX as China knew or

<sup>&</sup>lt;sup>280</sup> *Ibid* at 4-5.

<sup>&</sup>lt;sup>281</sup> Shirly Kan, Congressional Research Service, *CRS Report for Congress: China's Anti-Satellite Weapon Test* (2007), online: <a href="https://www.fas.org/sgp/crs/row/RS22652.pdf">https://www.fas.org/sgp/crs/row/RS22652.pdf</a>; Geoffrey Forden, "After China's Test: Time for a Limited Ban on Anti-Satellite Weapons" (April 2007) 37 Arms Control Today 19, online: <a href="http://legacy.armscontrol.org/act/2007\_04/Forden">http://legacy.armscontrol.org/act/2007\_04/Forden</a>.

<sup>&</sup>lt;sup>282</sup> James Mackey, "Recent US and Chinese Antisatellite Activities" *Air & Sp Power J* (1 September 2009), online: <www.au.af.mil/au/afri/aspj/airchronicles/apj/apj09/fal09/mackey.html>.

<sup>&</sup>lt;sup>283</sup> Kan, *supra* note 281 at 2.

<sup>&</sup>lt;sup>284</sup> Mackey, *supra* note 282.

<sup>&</sup>lt;sup>285</sup> While ASAT testing is not strictly proscribed by international law, the intentional creation of debris in such magnitude arguably violates a State's responsibility to not cause transboundary harm. *Trail Smelter Case (United States v Canada)*, Decision, (1941) Arbitral Trib, 3 UN Rep Intl Arb Awards 1905 at 716. ("under principles of international law, as well as the law of the United States no state has the right to use or permit the use of territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or person therein, when the case is of serious consequences an the injury is established by clear and convincing evidence."); "The responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other states or of areas beyond the limits of national jurisdiction." UNGAOR, *United Nations Conference on the Human Environment*, 27th Sess, UN Doc A/RES/2994 (1972) [Stockholm Declaration].

should have known the consequences of destroying a satellite on-orbit.<sup>286</sup> The overt attempts by the US to provide notice of its test could also be viewed as the US confirming Article IX is an affirmative obligation to announce ASAT tests and similar debris generating activities. Accordingly, if a State determines its activities either in creating the safety and security zone or the activity within the zone may potentially cause harmful interference with activities of another State, they must engage or offer to engage in consultation.

# 2. Registration Convention Requires Transparency

A source of seemingly mandatory transparency in outer space activity can be found in the 1974 Registration Convention.<sup>287</sup> The Registration Convention was an expansion of the provisions in the Outer Space Treaty vesting the "state of registry" with jurisdiction and control of its space objects and UN General Assembly Resolution No. 1721 B (XVI) (Resolution 1721B) calling on States to establish a national registry and provide registration information to the UN Secretary-General.<sup>288</sup> According to Article II of the Registration Convention, States are required to maintain a national registry of its space objects that have been launched into outer space. Additionally, the State who registers a space object is obligated to provide information about the space object to the UN Secretary-General<sup>289</sup> who maintains a universally accessible registry.<sup>290</sup> The information to be provided to the UN is:

- (a) name of launching State or States;
- (b) an appropriate designator of the space object or its registration number;
- (c) date and territory or location of launch:
- (d) basic orbital parameters; [...] and
- (e) general function of the space object.<sup>291</sup>

<sup>&</sup>lt;sup>286</sup> Kai-Uwe Schrogl & Julia Neumann, "Article IV, Outer Space Treaty" in Stephen Hobe, Bernhard Schmidt-Tedd, & Kai-Uwe Schrogl, eds, Cologne Commentary on Space Law: Outer Space Treaty, vol 1 (Luxembourg: Carl Heymanns Verlag, 2009) at 86 ("Article IX sentence 3 was the only provision seen as having been violated by the Chinese anti-satellite test in January 2007."). <sup>287</sup> *Registration Convention, supra* note 259.

<sup>&</sup>lt;sup>288</sup> Before the Outer Space Treaty and Registration Convention were adopted, States were required to register their space objects with the UN Secretary-General. UNGAOR 1085th Plen Mtg, Res/1721/B/(XVI) (1961). <sup>289</sup> Registration Convention, supra note 259, art 4.

<sup>&</sup>lt;sup>290</sup> Ibid, art III. Registry filings are now available on the COPUOS website. COPUOS, UN Register of Objects *launched into Space*, online: <www.unoosa.org/oosa/en/spaceobjectregister/index.html>. <sup>291</sup> *Registration Convention, supra* note 259, art 4.

Article IV does not require States to provide this information before or even close in time to the space object launching into outer space; instead, States are required to provide the information "as soon as practicable."<sup>292</sup> This conditional requirement results in states waiting months and years before providing registration information to the UN, if ever.

Article IV also encourages States to provide additional information regarding their space objects from "time to time."<sup>293</sup> Although only 62 States have ratified the Registration Convention,<sup>294</sup> the overwhelming adherence by States (consistent state practice) to the procedures set out in Resolution 1721B and their belief they are legally obligated to do so (*opinion juris*), have evolved the resolution into a part of customary international law and thus binding on all States.<sup>295</sup> The process of registering space objects forms a "chain of attribution in a sovereign free area" that serves to connect a "Launching State, space object and the general responsibility for space activities according to Article VI OST [Outer Space Treaty]."<sup>296</sup>

As seen in the Preamble of the Registration Convention, the overarching goal of the Convention is to provide transparency in space activities and foster compliance with international law.<sup>297</sup> Although States often take months or years to register their space objects after launch, over "92% of all satellites, probes, landers, manned spacecraft, and space station flight elements launched into Earth orbit or beyond have been registered with the Secretary-General."<sup>298</sup> Given the significant compliance, notwithstanding delayed filing, with the procedures set out in the Registration Convention and Resolution 1721B, a State could register their zone parameters with the UN Secretary-General along with the registration of the space

<sup>&</sup>lt;sup>292</sup> Ibid.

<sup>&</sup>lt;sup>293</sup> *Ibid*.

<sup>&</sup>lt;sup>294</sup> The vast majority of space-faring States are parties to the Registration Convention, thus distinguishing it from the Moon Agreement which also suffers from scant ratification. Frans G. von der Dunk, "The Registration Convention: Background and Historical Context" (2003) 46 Proc on L Outer Sp 450 at 450.

 <sup>&</sup>lt;sup>295</sup> Ram S. Jakhu, Bhupendra Jasani, & Jonathan McDowell, "Challenges in International Registration of Space Objects" (Paper, delivered at the International Conference on New Challenges in Space Law on "The Space Treaties at the Crossroads: Consideration for de lege ferenda", Athens, Greece, 28 August 2015) at 3 [Jakhu, *Registration*].
<sup>296</sup> Bernhard Schmidt-Tedd & Michael Gerhard, "Registration of Space Objects: Which are the Advantages for States Resulting from Registration?" in Marietta Benkö & Kai-Uwe Schrogl, eds, *Space Law: Current Problems and Perspectives for Future Regulation* (Utrecht, Netherlands: Eleven Intl Publishing, 2005) at 124.

<sup>&</sup>lt;sup>297</sup> The primary motivation for the treaty and its push for transparency in outer space activities is to identify liable States when damage is caused in outer space or on the surface of the Earth by space objects, so appropriate claims can be made. von der Dunk, *supra* note 294 at 451. "[T]he registration of space objects basically ensures the continuing jurisdiction and control in the non-sovereign area and provides its external transparency. If a State has a self-interest in an object launched into outer space [...], it will perform the registration [...]." Schmidt-Tedd, *supra* note 296 at 129.

<sup>&</sup>lt;sup>298</sup> COPUOS, "UN Register of Objects Launched into Outer Space", online: <www.unoosa.org/oosa/en/spaceobjectregister/index.html>.

object and update as necessary. Every satellite operator has access to the registration information and would be aware of the zone. The responsibility of updating and ensuring accuracy of the information would remain on the State of registry.<sup>299</sup> With the purpose of the Registration Convention being to make space activities more transparent and to foster adherence to international law, safety and security zones do not contravene its provisions and there is support for the conclusion a safety and security zone must be registered with the UN Secretary-General.

The Registration Convention, along with Article VIII of the Outer Space Treaty, indicate only the State of registry has the authority to register and thus establish a safety and security zone around a space object. Article VIII of the Outer Space Treaty dictates the State of registry maintains jurisdiction and control of its space objects when in outer space or on a celestial body. Article I of the Registration Convention defines the "State of registry" as a "launching State on whose registry a space object is carried."<sup>300</sup> For the purposes of the Registration Convention, the term "launching State" means "[a] State which launches or procures the launching of a space object," or "[a] State from whose territory or facility a space object is launched."<sup>301</sup> While seemingly straightforward, determining the appropriate State of registry has grown increasingly complex as commercial satellite and launch capabilities have led to multi-national space projects. Article II of the Registration Convention directs the launching States to decide which State places the space object on its register and notify the UN Secretary-General accordingly. Similar to the practice on the high seas regarding zones around military vessels, it would be anticipated safety and security zones would be declared around military or government space objects.

Regarding the registration of space objects, it must be noted that satellites in GEO who desire "international recognition" and freedom from harmful interference must be registered in the ITU Master International Frequency Register (MIFR).<sup>303</sup> The overall purpose of the MIFR is to register ITU's allocation of orbital slots and global radio spectrum to States, so harmful

<sup>&</sup>lt;sup>299</sup> While this process is theoretically available for recording and updating safety and security zones, the UN Register of Objects Launched into Outer Space (OOSA) has previously taken up to one year to post a registered space object on their registry. Jakhu, *Registration, supra* note 295 at 10.

<sup>&</sup>lt;sup>300</sup> *Registration Convention, supra* note 259, art 1.

<sup>&</sup>lt;sup>301</sup> *Ibid*.

<sup>&</sup>lt;sup>302</sup> This assumption is challenged by the increasing dependence of the US military on commercial space assets. Elizabeth S. Waldrop, "Integration of Military and Civilian Space Assets: Legal and National Security Implications" (LLM Thesis, McGill University Institute of Air and Space Law, 2003) at 17-18. However, it is unlikely that commercial satellites are adequately equipped to exercise self-defense if threatened or attacked with force.

<sup>&</sup>lt;sup>303</sup> International Telecommunication Union Radio Regulations, (Geneva: ITU, 2011) art 8.5 [Radio Regulations].

interference can be attributed and negated.<sup>304</sup> Overtime, GEO has become increasingly congested in areas covering large populations,<sup>305</sup> so a State's obligation to prevent harmful interference will impact the extent, duration, and location of safety and security zones in GEO. Additionally, military satellites are exempt from registration in the MIFR, but States are encouraged to observe ITU rules regarding the prevention of harmful interference.<sup>306</sup>

The transparency norm identified in Chapters 1 and 2 is wholly consistent with international space law and is supported by the common goals of mutual assistance and cooperation.

# D. Establishment of a Zone Does Not Grant Sovereign Rights

The bedrock principle of the outer space legal regime is the prohibition on national appropriation detailed in Article II of the Outer Space Treaty.<sup>307</sup> As a basic rule forming the foundation of international space law, non-appropriation is a rule of general international law.<sup>308</sup> At the time of adoption, the purpose of Article II was to prevent a territory grab, a repeat of colonialism, and hopes of not launching ongoing terrestrial conflicts into the heavens.<sup>309</sup> Reflecting on the signing of the Outer Space Treaty and its impact on international relations, President Lyndon Johnson described it as "the most important arms control development since the limited test ban treaty of 1963."<sup>310</sup> Article II of the Outer Space Treaty states, "Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of

<sup>&</sup>lt;sup>304</sup> *Ibid*.

<sup>&</sup>lt;sup>305</sup> Jakhu "Space Security", *supra* note 72 at 83-85.

 <sup>&</sup>lt;sup>306</sup> Constitution of the International Telecommunications Union, cited in Collection of the basic texts of the International Telecommunication Union adopted by the Plenipotentiary Conference, 2011 ed (Geneva: ITU 2011), art 48. This obligation amounts to a military installation showing "due regard" to other satellites. Sarah M. Mountin, "The Legality and Implications of International Interference with Commercial Communication Satellite Signals" (2014) 90 Intl L Stud 101 at 138.
<sup>307</sup> The Outer Space Treaty was the culmination of several UNGA Resolutions which placed outer space beyond the

<sup>&</sup>lt;sup>307</sup> The Outer Space Treaty was the culmination of several UNGA Resolutions which placed outer space beyond the sovereignty of any State. See, UNGAOR, *International Cooperation in the peaceful uses of outer space*, GA Res 1472, 14th Sess, UN Doc A/Res/1472 (1959); UNGAOR, *International Cooperation In the peaceful uses of outer space*, GA Res 1721, 16th Sess, UN DOC A/Res/1721 (1961); UNGAOR, *International cooperation in the peaceful uses of outer space*, GA Res 1802, 17th Sess, UN Doc A/Res/1802 (1962); UNGAOR, *International cooperation of legal principles governing the activities of States in the exploration and use of outer space*, GA Res 1962, UNGAOR, 18th Sess, UN Doc A/Res/1963 (1963).

<sup>&</sup>lt;sup>308</sup> Lachs, *supra* note 115 at 42.

<sup>&</sup>lt;sup>309</sup> Cheng, *supra* note 266 at 229.

<sup>&</sup>lt;sup>310</sup> Statement of President Johnson, 55 Department of State Bulletin (8 December1966) at 952 (Statement given on 8 December 1966 after agreement on Outer Space Treaty was actually reached).
sovereignty, by means of use or occupation, or by any other means.<sup>311</sup> This provision ensures outer space is beyond the territorial jurisdiction of any State, mirroring in large part the status of the high seas<sup>312</sup> as *res communis omnium*.<sup>313</sup> The differing modes of asserting sovereignty available in general international law are not available in outer space, thus "[s]tates have been barred from extending to them, and exercising within them, those rights which constitute attributes of territorial sovereignty."<sup>314</sup> Before considering whether zones may be established in outer space consistent with Article II, an examination of state practice regarding Article II is warranted.

1. Attempts to Assert Sovereignty and Private Property Rights in Outer Space: The Bogotá Declaration and a Parking Ticket

The Bogotà Declaration<sup>315</sup> confirmed States are unable to assert sovereignty over any parts of outer space. Several equatorial States (Colombia, Ecuador, Indonesia, the Congo, Kenya, Uganda, and the Democratic Republic of Congo, and Brazil as an observer) declared sovereignty over the corresponding portions of GEO above their terrestrial territory as their natural resources. They premised their argument on several factors, most important being the lack of a definition for outer space, and their belief GEO was not a part of outer space. In essence, their sovereignty over national airspace extended vertically to GEO. In addressing the apparent conflict with Article II of the Outer Space Treaty, the declaration says the Outer Space Treaty:

cannot be considered as a final answer to the problem of the exploration and use of outer space, even less when the international community is questioning all the terms of international law which were elaborated when the developing countries could not count on adequate scientific advice and were thus not able to observe and evaluate the

<sup>&</sup>lt;sup>311</sup> Outer Space Treaty, supra note 14, art 2.

<sup>&</sup>lt;sup>312</sup> Bruce A. Hurwitz, *The Legality of Space Militarization*, (Amsterdam: Elsevier Science Publishers B.V., 1986) at 29. See *Fisheries Jurisdiction Case (Great Britain & Northern Ireland v Iceland)* Merits [1974] ICJ Rep 3, Separate opinion of Judge Castro, at 81 ("[T]he high seas, *res communis omnium*, is not something that lends itself to ownership; its use is common to everybody, and this applies also to fishing. The sea *unquam fuit a communion separatum*, and unlike land and rivers, there is no reason to divide it up....").

<sup>&</sup>lt;sup>313</sup> Gyula Gal, *Space Law* (Leyden/Dobbs Ferry, NY: Sijthoff/Oceana, 1969) at 189; But see, Benkö *supra* note 296 at 13 (outer space does not qualify as *res*, thus it cannot be considered as *res communis omnium*); Ernst Fasan, "The Meaning of the Term 'Mankind' in Space Legal Language" (1974) 2 J Sp L 125 at 128; Lachs, *surpa* note 115 at 46 ("One can hardly argue that outer space and celestial bodies, though physically the latter may be reminiscent of some parts of our globe, can be encompassed by this term. None of them being res, they cannot in fact become res extra commercium or communis.").

 <sup>&</sup>lt;sup>314</sup> Lachs, *supra* note 115 at 41, citing *North Atlantic Coast Fisheries Arbitration* (1910) PCA, VII, at 114.
<sup>315</sup> "The Declaration of the First Meeting of the Equatorial States, Bogotá" (1978) 6 J Sp L 193 [*Bogatà Declaration*].

omissions, contradictions and consequences of the proposals which were prepared with great ability by the industrialized powers for their own benefit.<sup>316</sup>

These States declared that any State wishing to put a satellite into GEO would need their permission, because they had a "complete and exclusive sovereignty over the corresponding air and cosmic space segment of the [GEO]."<sup>317</sup> This declaration did not gain support outside of the declaratory States<sup>318</sup> and no State has sought their permission to place a satellite into GEO,<sup>319</sup> thus it never altered the legal landscape of outer space. Instead, it re-enforces the total bar on national appropriation laid down in Article II.

Recognizing outer space has potential for commercial activity, the Outer Space Treaty makes provision for private citizens to carry on activities in outer space, subject to the oversight by the responsible government.<sup>320</sup> Even though Article II only proscribes national appropriation, the prevailing interpretation is that private citizens cannot assert private property rights over any portion of outer space, just as States cannot assert territorial sovereignty.<sup>321</sup> This principle was tested when Mr. Gregory Nemitz, a US citizen, claimed ownership of Asteroid 43 Eros by a registered claim of title. Based on his claim of ownership, Mr. Nemitz sent NASA a parking charge for landing a spacecraft on the asteroid. Not surprisingly, NASA denied the claim and forwarded the bill to the US Department of State who denied the claim as well relying on Article II of the Outer Space Treaty.<sup>322</sup> Mr. Nemitz took his claim to US District Court, and eventually to the Ninth Circuit Court of Appeals, where the court upheld the District Court's ruling for failing to state a cause of action.<sup>323</sup> Given the lack of acceptance of the Bogotà Declaration and the denial of Mr. Nemitz' claim, Article II of the Outer Space Treaty is absolute in its prohibition of States exercising territorial sovereignty and private citizens claiming property rights over outer space, the Moon, and other celestial bodies.

<sup>&</sup>lt;sup>316</sup> Ibid.

<sup>&</sup>lt;sup>317</sup> *Ibid*.

<sup>&</sup>lt;sup>318</sup> Katrin Nyman Metcalf, Activities in Space – Appropriation or Use? (Uppsala: Iustug Förlag, 1999) at 231-32.

<sup>&</sup>lt;sup>319</sup> Francis Lyall & Paul B. Larsen, Space Law: A Treatise (Surrey, England: Ashgate Publishing, 2009) at 255. <sup>320</sup> Outer Space Treaty, supra note 14, art 6.

<sup>&</sup>lt;sup>321</sup> Cheng, supra note 266 at 233 (Outer space is not subject to appropriation in private law either, because there is no sovereign in outer space to confer such titles of ownership.).

<sup>&</sup>lt;sup>322</sup> Leonard David, "Who Owns the Asteroids? Space Mining Project Raises Legal Questions", Space.com (10 July 2012), online: <www.space.com/1615-space-mining-asteroid-legal-issues.html>.

<sup>&</sup>lt;sup>323</sup> Gregory Nemitz v US, 2005 US Lexis 2350 (9th Cir); Paul B. Larsen, "Asteroid Legal Regime: Time for a Change?" (2014) 39:2 J Sp L 275 at 284-85.

## 2. Declaration of a Zone Does Not Amount to National Appropriation

The unequivocal ban on national appropriation and the corresponding freedom of exploration and use principles are the highest legal hurdle for safety and security zones in outer space. The hurdle is not that zones could lead to a valid claim of sovereignty, but instead the zone would amount to effective authority,<sup>324</sup> thus the area would be no longer free for exploration and use. A look back to the keep-out zones and SDZs proposed by the US during the Cold War,<sup>325</sup> one can see retrospectively the US would have been unable to meet its international obligations under Article II of the Outer Space Treaty had it implemented either proposal. Bittlinger surveyed the differing points of view regarding the relationship between keep-out zones and the nonappropriation principle and concluded the unilateral proclamation of keep-out zones as envisioned by the US was not compatible with Article II of the Outer Space Treaty.<sup>326</sup> This was notwithstanding the argument put forward by the OTA in support of keep-out zones and the apparent conflict with Article II:

A counter argument might hold that current international practice with respect to communication satellites in geosynchronous orbit already incorporates a variation of the "keep-out zone" principle. Current geosynchronous orbit must be space several degrees apart in order to avoid frequency interference. Therefore, such a satellite precludes the placement of other satellites near its position in the orbital arc.<sup>327</sup>

The OTA argument was never put to the test as the US never declared keep-out zones, but its comparison of keep-out zones to GEO does not appear sound. The orbital slot allocations in GEO are coordinated by an international agreed upon system administered by the ITU.<sup>328</sup> The ITU ensures that communication satellites in GEO, that are registered in the MIFR are protected against interference.<sup>329</sup> If interference occurs, resolution is pursued through bilateral

<sup>&</sup>lt;sup>324</sup> Malcom M. Shaw, *International Law*, 6th ed (Cambridge, UK: Cambridge University Press, 2008) at 511 ("The exercise of effective authority, [...] is the crucial element" in establishing territorial sovereignty. at 511). <sup>325</sup> See Part I-C-2, *above*, for more on this topic.

<sup>&</sup>lt;sup>326</sup> Horst Bittlinger, "Keep-Out Zones' and the Non-Appropriation Principle of International Space Law" (1988) 31 Proc on L Outer Sp 6 at 10.

<sup>&</sup>lt;sup>327</sup> OTA Report, supra note 65 at 118.

<sup>&</sup>lt;sup>328</sup> "About ITU", online: ITU <www.itu.int/en/about/Pages/default.aspx>.

<sup>&</sup>lt;sup>329</sup> Radio Regulations, supra note 303, art 8.1.

negotiations<sup>330</sup> and subsequent arbitration if necessary.<sup>331</sup> States do not have the right to enforce their "freedom from interference" with force. Keep-out zones, as contemplated, were representative of "space power" and not space security, as the intent was to protect US weapons systems at all costs. The US would have asserted a right of enforcement it did not possess to protect itself from a potential threat from the USSR. On the other hand, SDZs did support space security as the concept was proposed as an alternative arms control measure, but fails the non-appropriation principle as portions of GEO would be ceded to States or groups of States. The concept of keep-out zones and SDZs<sup>332</sup> consisted of an indefinite duration, a large area, and the right to use force simply for entering the zone or violating established rules, thus the concepts are clearly in contravention of the non-appropriation principle.

Most criticisms and protests regarding zones on the high seas and the adjacent airspace focus on the derogation of the freedom of navigation and the need to show due regard towards the actions of other States; however, the concepts of freedom of navigation and the prohibition on national appropriation are inherently interrelated. Just as with international space law, the law of the sea prohibits claims of national sovereignty for the purpose of ensuring freedom of navigation. Accordingly, no matter the action taken by a State, that action cannot result in a valid claim of sovereignty.

Zones which are of an indefinite duration, such as ADIZs and the AMIS, represent the most direct challenge to Article II's prohibition on national appropriation. Even before rules governing ADIZs crystalized into custom,<sup>333</sup> Brownlie concluded, "ADIZs are generally accepted and not considered to be illegal, because force is not used in maintenance of the zone."<sup>334</sup> Notwithstanding China's ESC ADIZ,<sup>335</sup> the ADIZ model of voluntary compliance, information gathering, and established protocols support space security and do not amount to national appropriation. However, the overall premise of ADIZs and AMIS to control entry into

<sup>&</sup>lt;sup>330</sup> Jakhu, "Space Security", *supra* note 72 at 88.

<sup>&</sup>lt;sup>331</sup> Ram Jakhu, "Regulatory Process for Communications Satellite Radio Frequencies" in Joseph N. Pelton, Scott Madry, & Sergio Camacho Lara, eds, *The Handbook of Satellite Applications* (New York: Springer Science & Business Media, 2013) at 290.

<sup>&</sup>lt;sup>332</sup> The SDZ proposal required GEO to be partitioned and different regions assigned to different alliances for the placement of space objects, thus it was in obvious contravention of Article II of the Outer Space Treaty. See Part I-D-2-b, *above*, for more on SDZs.

<sup>&</sup>lt;sup>333</sup> Almond, *supra* note 213 at 135.

<sup>&</sup>lt;sup>334</sup> Ian Brownlie, "The Maintenance of International Peace and Security in Outer Space" (1964) 40 Brit YB Intl L 1 at 5.

<sup>&</sup>lt;sup>335</sup> Almond, *supra* note 213 at 183.

national airspace or territorial waters represents a significant limit to *in toto* applicability to outer space. Although States do not mandate compliance through the use or threat of force, the denial of entry into national airspace does represent a significant interest for States to comply that does not exist in outer space. This limit represents a significant feasibility limitation and does not impact a State's right to request information when a space object has entered an established zone. In the future, space hotels and other tourist activities will assuredly have the ability to dock spacecraft and could arguably use the ADIZ construct to restrict access without being in violation of Article II.<sup>336</sup>

## 3. Sovereignty Does Not Extend Beyond the Space Object

An alternative approach to melding zones with the non-appropriation principle is to expand the definition of space object beyond the generally accepted meaning. Rothblatt put forward a thesis that concludes space objects, which he notes are not definitively defined in the UN space law treaties, need a certain area of operation and such space is "really more a part of the space object than they are a part of space itself."<sup>337</sup> He describes this area as "object-space" and according to Article VIII of the Outer Space Treaty is under the jurisdiction and control of the State of registry.<sup>338</sup> As Bittlinger notes, Rothblatt's thesis is not found in the Outer Space Treaty and his assumption that Article VIII grants some amount of external jurisdiction superseding the non-appropriation principle in Article II cannot be supported and is not shared by most authors.<sup>339</sup> Rothblatt's thesis regarding operational space is not without merit as space objects do require a certain area for safe operation. For example, NASA has designated a large area surrounding the ISS as an area of safe operation and when the JSpOC predicts a close encounter, the ISS will take evasive action or other precautions.<sup>340</sup> Importantly, NASA or the other ISS member states have not asserted sovereignty or external jurisdiction in this area of safe operations, nor have they attempted to preclude other space objects from entering the area.

<sup>&</sup>lt;sup>336</sup> I.H.Ph. Diederiks-Verschoor & Vladimar Kopal, *An Introduction to Space Law* (The Netherlands: Kluwer Law International, 2008) at 92.

<sup>&</sup>lt;sup>337</sup> Martin A. Rothblatt, "State Jurisdiction and Control in Outer Space" (1983) 26 Proc on L Outer Sp 135 at 136. <sup>338</sup> *Ibid* at 136-37.

<sup>&</sup>lt;sup>339</sup> Bittlinger, *supra* note 326 at 9.

<sup>&</sup>lt;sup>340</sup> Mark Garcia, ed, "Space Debris and Human Scpacecraft" (27 July 2016), online: NASA

<sup>&</sup>lt;www.nasa.gov/mission\_pages/station/news/orbital\_debris.html> (The area is known as the "pizza box" due to its flat, rectangular shape. It measures 30 miles across by 30 miles long (1.5 x 50x 50 kilometers).

As long as States do not assert sovereignty beyond the confines of the space object, either explicitly or implicitly, safety and security zones are compatible with the non-appropriation principle.

## E. Law that Applies Outside the Zone, Applies Inside the Zone

While not necessarily a challenge, the reality a State cannot gain additional rights, such as enforcement of the zone parameters, by declaring a safety and security zone questions the utility of creating such a zone. The purpose of zones is succinctly described in the Introduction of the US Naval War College manual on *Maritime Operational Zones*:

[P]romulgation of a warning area beyond the territorial sea in conjunction with a weapons test, for example, does not extinguish the right of other nations to operate in those waters. Indeed, when such tests are announced it is often a signal for intelligence platforms of other nations to proceed to the area for surveillance purposes. And properly so. In short, warning areas are just that: notifications of potential hazard. They are not exclusion zones.<sup>341</sup>

The standard is clear. States must respect the freedom of exploration and use of other States and the non-appropriation principle within an established zone. As noted in the above passage, exclusion zones do not allow freedom of exploration and use within their bounds and were often enforced with use or threat of force. Consequently, exclusion zones are considered unlawful in international law. If safety and security zones are to be established in outer space under the current legal regime, the creating State must be aware that adversarial States and States interested in protesting potentially norm creating behavior, can and will test zone parameters.

## 1. Freedom of Exploration and Use Must Be Preserved

The guarantee of free access to outer space provided in Article I of the Outer Space Treaty must be read in conjunction with the non-appropriation principle in Article II and the due regard principle in Article IX. As such, the right to free access cannot be seen as limitless,<sup>342</sup> because States must show due regard for the interests of others operating in outer space and

<sup>&</sup>lt;sup>341</sup> Richard J. Grunawalt, "Introduction to the 2006 Edition" in Jacques, *supra* note 135 at 16.

<sup>&</sup>lt;sup>342</sup> Cepelka *supra* note 263 at 34 ("If a State takes advantage of its right in such a fashion as to inflict unjustifiable injury upon another state, then state responsibility is involved because an abuse of right enjoyed by virtue of an international legal norm.").

continuous free access can never materialize into a claim of sovereignty. Article I, representing the "common interests" principle,<sup>343</sup> states:

The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.

Outer space, including the moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies.

There shall be freedom of scientific investigation in outer space, including the moon and other celestial bodies, and States shall facilitate and encourage international cooperation.<sup>344</sup>

The freedom of overflight guaranteed in Article I, that is the freedom for a space object in orbit to pass over the sovereign territory of another State without violating such sovereignty, was established with the flight of Sputnik I. In the *North Sea Continental Shelf Case*, Judge Lachs acknowledged Sputnik I's overflight as an example of how customary international law can rapidly develop.<sup>345</sup> Before the flight of Sputnik I, the legality of orbital flight around the Earth was not settled, but the guarantee of free exploration and use of outer space is now seen as a natural consequence of outer space being *res communis omnium*, much like the high seas.<sup>346</sup>

Article I(1) of the Outer Space Treaty imposes a limitation that results in the exploration and use only being allowed to the extent which they are "for the benefit and in the interests of all countries." The meaning of this phrase does not have a universal understanding;<sup>347</sup> but it nonetheless indicates some level of cooperation is required among all countries.<sup>348</sup>

<sup>&</sup>lt;sup>343</sup> Nicolas M. Matte, ed, *Space Activities and Emerging International Law* (Montreal: Centre for Research of Air & Space Law, McGill University, 1984) at 270, 272.

<sup>&</sup>lt;sup>344</sup> Outer Space Treaty, supra note 14, art 1.

<sup>&</sup>lt;sup>345</sup> North Sea Continental Shelf Cases (Federal Republic of Germany v Denmark; Federal Republic of Germany v Netherlands), Dissent Opinion Lachs [1969], ICJ Rep 3 at 230.

<sup>&</sup>lt;sup>346</sup> Cheng, *supra* note 266 at 230 (text from an article, "The 1967 Space Treaty", first published in 1968).

<sup>&</sup>lt;sup>347</sup> See e.g. *Ibid* (The phrase should be viewed as a binding legal obligation. While the exact interests cannot be easily deduced, all States clearly have a right to the "fruits of space exploration and use, by whomsoever carried out.").

<sup>&</sup>lt;sup>348</sup> Stephan Hobe, "Outer Space as the Province of Mankind – An Assessment of 40 Years of Development" (2007) 50 Proc on L Outer Sp 442 at 444.

It goes without saying space activity is ultra-hazardous not only because of an unpredictable physical environment,<sup>349</sup> but also because of the possibility of intentional and unintentional escalatory actions by other states. Article I of the Outer Space Treaty allows States to launch, operate, and even destroy their own satellites without seeking permission from other States or an international body.<sup>350</sup> A question arises here regarding a State's right to conduct potentially dangerous activity in outer space, such as OOS, ADR, or testing of a conventional weapons system. Since each State has the right to conduct these activities without interference from other States, it is arguable that they have a right to limit activity in close proximity to such operations. The US Navy made such an argument regarding the right to establish a "safety launch zone" within the larger warning area when launching a Trident missile. Acknowledging the US did not have a right to enforce a warning area, the US Navy distinguished the smaller "launch safety zone" as being necessary, because interference with the trajectory of a missile would put the crew and third parties at risk.<sup>351</sup> The US Navy further argued Greenpeace "had a responsibility to show 'due regard' for the Navy's legitimate use of the seas and should not have interfered with its launch."<sup>352</sup> The result is a balancing act to preserve the rights of all users of space. The State conducting the space activity or experiment inside the safety and security zone is exercising its freedom under Article I, but this freedom must be carried out in a way that does not prevent another State from exercising their same freedoms. There is no prioritization of space activities, thus cooperation and transparency are necessary.

## 2. Jurisdiction and Control: The Space Object is the Limit

As established above,<sup>353</sup> outer space and the high seas are beyond the territorial sovereignty of States. Historically, jurisdiction only flowed from sovereignty, and States could not assert jurisdiction beyond their territory as demonstrated in the Lotus Case of 1927:

<sup>&</sup>lt;sup>349</sup> C. Wilford Jenks, *Liability for Ultra-Hazardous Activities in International Law*, vol 117 (Leiden, The Netherlands: Brill Nijhoff, 1966) at 105.

<sup>&</sup>lt;sup>350</sup> Michael N. Schmitt, "International Law and Military Operations in Space" (2006) 10 Max Planck YB of UN L 89 at 101. Regarding the right of a State to destroy its own satellites, consider the 2007 Chinese ASAT test. Although the test was publicly condemned, the US destroyed a de-orbiting satellite a year later. Michael Krepon & Sonya Schoenberger, "A Comparison of Nuclear and Anti-Satellite Testing, 1945-2013" in Michael Krepon & Julia Thompson, eds, *Anti-Satellite Weapons, Deterrence and Sino-American Space Relations* (Washington, DC: Stimson Foundation, 2013) at 131.

<sup>&</sup>lt;sup>351</sup> Van Dyke, "Exclusion & Warning Zones", *supra* note 145 at 164.

<sup>&</sup>lt;sup>352</sup> Ibid.

<sup>&</sup>lt;sup>353</sup> See Part II-C, *above*, for more on the law of the sea. See Part II-D, *above*, for more on international air law.

Now the first and foremost restriction imposed by international law upon a State is that – failing the existence of a permissive rule to the contrary – it may not exercise its power in any form of another territory of another State. In this sense jurisdiction is certainly territorial; it cannot be exercised by a State outside its territory except by virtue of a permissive rule derived from international custom or from a convention.<sup>354</sup>

Clearly, States cannot assert jurisdiction in outer space premised on territorial sovereignty. The need for other forms of jurisdiction exists on the high seas and in outer space. Professor Cheng identifies three types of jurisdiction: the traditional or territorial jurisdiction, personal jurisdiction over its nationals, and *quasi-territorial* or floating island jurisdiction.<sup>355</sup> It is the latter two forms of jurisdiction that give States the ability to assert control and maintain responsibility over objects and persons in outer space,<sup>356</sup> but not violate Article II of the Outer Space Treaty and the principle of non-appropriation.

The quasi-territorial jurisdiction that States exercise in outer space and the high seas has been codified in both the Outer Space Treaty and UNCLOS. Article VIII of the Outer Space Treaty states, "a State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body." Similarly, the law of the sea has historically required ships to be registered with a particular country and it was codified in Article 94 of UNCLOS which states, "every State shall effectively exercise its jurisdiction and control in administrative, technical and social matters over ships flying its flag." Through these respective provisions, it is apparent space objects are under State jurisdiction in a similar fashion to ships on the high seas.

Once a space object is registered in the national registry of a State, that State begins to assert quasi-territorial jurisdiction. The State gains the right of control over its space object, which means the State of registry "has a right to require other States to refrain from interfering

<sup>&</sup>lt;sup>354</sup> The Case of the S.S. Lotus (Turkey v France), (1927) Judgment, PCIJ (Ser A/10), No 9 at para 45.

<sup>&</sup>lt;sup>355</sup> Cheng, *supra* note 266 at 135. Professor Cheng describes quasi-territorial jurisdiction as, "In between territorial jurisdiction and personal jurisdiction stand quasi-territorial jurisdiction. This is the sum total of the powers of a State in respect of ships, aircraft, and space craft [...] having its nationality. [...] Quasi-territorial jurisdiction differs from personal jurisdiction in that it extends not only to the craft in question but also to all person and things onboard, including the activities of such persons, whether on board the craft or elsewhere." *Ibid.* <sup>356</sup> See e.g., Article II of the *Registration Convention*:

Where there are two or more launching States in respect of any such space object, they shall jointly determine which one of them shall register the object in accordance with paragraph 1 of this article, bearing in mind the provisions of article VIII of the Treaty on Principles governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, and without prejudice to appropriate agreements concluded or to be concluded among the launching States on jurisdiction and control over the space object and over any personnel thereof.

with the direction and supervision of the object or with any of the technical arrangements necessary for the fulfilment of its mission of exploration and use of outer space."<sup>357</sup> When Articles II and VIII of the Outer Space Treaty are considered together, the result is States can assert jurisdiction over its space objects and personnel, but not beyond. As discussed above, there is no support in the Outer Space Treaty for "external jurisdiction" surrounding space objects. Accordingly, safety and security zones do not establish jurisdiction or control beyond the space object.

## 3. Right of Self-Defense

It has been firmly established in an earlier section<sup>358</sup> that general international law and the Charter are applicable to international relations in outer space. One early scholar, Professor J.E.S. Fawcett, posited that international law, including the Charter did not place "any upper limit above the surface of the Earth on the legitimate exercise of the right of self-defense."<sup>359</sup> The Charter aims to maintain international peace and security by normalizing international relations.<sup>360</sup> Toward this goal, Article 2(4) demands that

[a]ll Members shall refrain in their international relations from the threat or use of force against the territorial integrity or political independence of any state, or in any other manner inconsistent with the Purposes of the UN.<sup>361</sup>

Recognizing that circumstances do arise where States would be justified in using force, Article

51 of the Charter provides,

Nothing in the present Charter shall impair the inherent right of individual self-defense if an armed attack occurs against a Member of the UN, until the Security Council has taken measures necessary to maintain international peace and security...<sup>362</sup>

Together, these provisions prohibit the threat and use of force while preserving the right for States to defend themselves and others.

<sup>&</sup>lt;sup>357</sup> Lachs, *supra* note 115 at 66.

<sup>&</sup>lt;sup>358</sup> See Part III-B, *above*, for more on this topic.

<sup>&</sup>lt;sup>359</sup> J.E.S. Fawcett, *International Law and the Use of Outer Space* (Manchester, UK: Manchester University Press, 1968) at 39.

<sup>&</sup>lt;sup>360</sup> *Charter, supra* note 220 at Preamble. Article 1, para 1 of the *Charter* describes the objective of the UN as: "To maintain international peace and security, and to that end: to take effective collective measures for the prevention and removal of threats to the peace, and for the suppression of acts of aggression or other breaches of the peace..." *Ibid*, art 1(1).

<sup>&</sup>lt;sup>361</sup> *Ibid*, art 2(4).

<sup>&</sup>lt;sup>362</sup> *Ibid*, art 51.

The prohibition on the threat or use of force, unless exercising self-defense or authorized by the UN Security Council,<sup>363</sup> represents an important limitation on safety and security zones. For example, China's threat of using military interdiction to enforce its ESC ADIZ represents an attempt to change the status quo and assert rights that are not afforded to it.<sup>364</sup> Although there has been little attention given to the prohibition on the threat of force, it is equally prohibited. It often does not receive attention, because the threat precedes the actual use of force and the two parts are analyzed together; however, threats of force are not generally considered to be sufficient for responsive action.<sup>365</sup> This is evidenced by considering that "state practice reveals a relatively high degree of tolerance towards mere threats of force."<sup>366</sup> Notwithstanding State's reluctance to respond to threats of force, the prohibition remains.

In Article 51 of the Charter, the right of self-defense is described as an "inherent" right, recognizing that States have always had the right of individual and collective self-defense. Although Article 51 of the Charter limits self-defense to those instances where an armed attack has occurred, customary international law authorizes self-defense in anticipation of an attack under specific circumstances:

A State must determine that the force used was necessary (there are no other peaceful means to thwart the attack or threat); and the amount of force applied must be proportional to the threat or attack.<sup>367</sup>

"Anticipatory self-defense" was first put forward as a justification for the use of force in the Caroline case during which the US and UK exchanged letters acknowledging the right to use force in anticipation of harm falling on their citizens.<sup>368</sup> The ICJ found the right of self-defense in customary international law does not conflict with the provision for self-defense under Article

<sup>&</sup>lt;sup>363</sup> Authorizations of use of force by the Security Council under Chapter 7 of the Charter are beyond the scope of this work. See *Ibid*, chap 7.

<sup>&</sup>lt;sup>364</sup> See Part II-D-2, *above*, for more on China's ESC ADIZ.

<sup>&</sup>lt;sup>365</sup> Robert A. Ramey, "Armed Conflict on the Final Frontier: The Law of War in Space" (2000) 48 AFL Rev 1 at 61.

<sup>&</sup>lt;sup>366</sup> Albrecht Randelzhofer, "Article 2(4)" in Bruno Simma, et al, eds, *The Charter of the UN: A Commentary*, 2nd ed (Oxford: Oxford University Press, 2002) at 118.

<sup>&</sup>lt;sup>367</sup> D.W. Bowett, *Self-Defense in International Law* (New York: Praeger, 1958) at 188-89 ("The right [of self-defense] has, under traditional international law, always been 'anticipatory,' that is to say its exercise was valid against imminent as well as actual attacks and dangers."); But see Yoram Dinstein, *War, Aggression and Self-Defense*, 3rd ed (Cambridge: Cambridge University Press, 2001) at 87 ("The liberty to venture into war, and generally to employ inter-State force, is obsolete." at 87). <sup>368</sup> "Secretary of State Daniel Webster to Mr. Fox, British Minister at Washington" (24 April 1841) ("The Caroline

<sup>&</sup>lt;sup>308</sup> "Secretary of State Daniel Webster to Mr. Fox, British Minister at Washington" (24 April 1841) ("The Caroline Case"), in John Bassett Moore & Francis Wharton, *A Digest of International Law*, sec 217 (Washington, DC: U.S. Government Printing, 1906).

51 of the Charter, thus both sources of law exists simultaneously.<sup>369</sup> Accordingly, a State may exercise its right to self-defense at some time prior to being attacked, but the "necessity of self-defense is instant, overwhelming, and leaving no choice of means, and no moment for deliberation."<sup>370</sup> Where exactly this point arises is a factual determination made by the State.

The principles of necessity and proportionality will guide the State's actions and will form the basis of any inquiry into the State's justification for acting in self-defense.<sup>371</sup> In several cases, the ICJ has "recognized self-defense warrants only those measures 'proportional to the armed attack and necessary to respond to it' as a 'rule well established' in customary international law."<sup>372</sup> The application of these principles present unique challenges in the outer space environment where it is difficult to determine what constitutes an armed attack. Looking back at the analysis regarding zones in other domains, where the exercise of self-defense may be viewed as analogous,<sup>373</sup> one purpose of creating a zone is to better distinguish hostile intent and thus only respond in self-defense when necessary. In considering the necessity principle, the transparency gained by a safety and security zone can aid the State in making a "reasonable conclusion on the basis of facts reasonably known at the time, that an armed attack has occurred or is reasonably believed to be imminent, thus supporting the proposed use of force."<sup>374</sup>

Safety and security zones are allowed in international space law and when implemented in accordance with the three identified norms, the increase in transparency and reduction in ambiguity of motive serve to strengthen space security.

<sup>&</sup>lt;sup>369</sup> Case Concerning Military and Paramilitary Activities in and against Nicaragua (Nicaragua v US), Jurisdiction and Admissibility, [1984] ICJ Rep 392 at para 176.

<sup>&</sup>lt;sup>370</sup> Shaw, *supra* note 324 at 1131.

<sup>&</sup>lt;sup>371</sup> Christin Gray, *International Law and the Use of Force* (Oxford: Oxford University Press, 2000) at 120-21 (The author is discussing the holding of the ICJ in Nicaragua.).

<sup>&</sup>lt;sup>372</sup> Mountin, *supra* note 306 at 194; See e.g. *Nicaragua* at para 361; *Oil Platforms (Iran v US)* [2003] ICJ Rep 161 at para 74; *Legality of the Threat or Use of Nuclear Weapon*, Advisory Opinion [1996] ICJ Rep 226 at para 41. <sup>373</sup> Hurwitz, *supra* note 312 at 73.

 $<sup>^{374}</sup>$  Shaw, *supra* note 324 at 1141.

## Conclusion

The unilateral establishment of safety and security zones in outer space does not violate international space law when the zones comply with the identified norms from other domains. Zones must be transparent in creation and operation. States cannot obtain or assert sovereignty over the zone. And finally, a State is bound by the same set of rules within the zone that the State is entitled to outside the zone. Given the unique outer space environment and the challenges of SSA, it is unclear if safety and security zones will provide any tangible benefit to a State when unilaterally declared. Other States have no obligation to recognize or comply with a zone. Consequently, zones could be viewed by other States as a de-facto red line and ultimately escalate tensions.<sup>375</sup> The review of zones in the sea and air domains demonstrate that zones can contribute to the maintenance of space security by eliminating ambiguity and clarifying motive as new security threats emerge.

<sup>&</sup>lt;sup>375</sup> In considering exclusion zones on the high seas, Brownlie writes, "Undoubtedly unilateral claims to security zones would increase the likelihood of breaches of the peace." Brownlie, *supra* note 334 at 5.

# Bibliography

## TREATIES

- Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, 18 December 1979, 1363 UNTS 3 (entered into force 11 July 1984).
- Agreement on the Rescue of Astronauts and the Return of Objects Launched into Outer Space, 22 April 1968, 19 UST 7570, 672 UNTS 119 (entered into force 3 December 1968).
- Charter of the United Nations, 26 June 1945, Can TS 1945 No 7.
- Constitution of the International Telecommunications Union, cited in Collection of the basic texts of the International Telecommunication Union adopted by the Plenipotentiary Conference, 2011 ed (Geneva: ITU 2011).
- *Convention on International Civil Aviation*, 7 December 1944, 15 UNTS 295 (entered into force 4 April 1947).
- Convention on International Liability for Damage Caused by Space Objects, 29 March 1972, 24 UST 2389, 961 UNTS 187 (entered into force 1 September 1972).
- Convention on Registration of Objects Launched into Outer Space, 14 January 1975, 28 UST 695, 1023 UNTS 15 (entered in to force on 15 September 1976).
- International Telecommunication Union Radio Regulations, (Geneva: ITU, 2011).
- Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 27 January 1967, 19 UST 2410, 610 UNTS 205 (entered into force on 10 October 1967).
- United Nations Convention on the Law of the Sea, 10 December 1982, 1833 UNTS 3; 21 ILM 1261 (entered into force on 16 November 1994).

#### JUDICIAL DECISIONS

- Fisheries Jurisdiction Case (United Kingdom & Northern Ireland v Iceland) Merits, [1974] ICJ Rep 3.
- Gregory Nemitz v US, 2005 US Lexis 2350 (9th Cir).
- In the Matter of the South China Sea Arbitration (Philippines v China), Award (2016), PCA Case No 2013-19, online: Permanent Court of Arbitration <a href="https://pca-cpa.org/wp-content/uploads/sites/175/2016/07/PH-CN-20160712-Award.pdf">https://pca-cpa.org/wp-content/uploads/sites/175/2016/07/PH-CN-20160712-Award.pdf</a>>.

Knox v Gye (1871), LR 5 HL 656 (UK House of Lords).

Legality of the Threat or Use of Nuclear Weapon, Advisory Opinion, [1996] ICJ Rep 226.

- Military and Paramilitary Activities in and against Nicaragua (Nicaragua v United States), Merits, [1986] ICJ Rep.
- North Sea Continental Shelf Cases (Germany v Denmark, Germany v Netherlands), Merits, [1969] ICJ Rep 3.
- Nuclear Tests Cases (Australia v France, New Zealand v France), Judgment [1974] ICJ Rep 253.
- The Case of the S.S. Lotus (Turkey v France), Judgment, (1927) PCIJ (Ser A/10), No 9.
- *Trail Smelter Case (United States v Canada)*, Decision, (1941) Arbitral Trib, 3 UN Rep Intl Arb Awards 1905.

#### INTERNATIONAL DOCUMENTS

- European Parliament. Resolution on the Forthcoming World Conference on International Telecommunications (WCIT-12) of the International Telecommunications Union and the Possible Expansion of the Scope of International Telecommunication Regulations, Eur Parl Doc P7\_TA (2012)0451 §5.
- UNCOPOUS, Consideration of a treaty governing the exploration and use of outer space, the moon and other celestial bodies, (26 July 1966) A/AC.105/C.2/SR.68.

- UNGAOR. Declaration of Legal Principles Governing the Activities of States in the Exploration and Uses of Outer Space, GA Res 1962 (XVIII), 18th Sess, Supp No 15, UN Doc A/5515 (1963).
  - ------. International cooperation in the peaceful uses of outer space, GA Res 1963, 18th Sess, UN Doc A/Res/1963 (1963).

-----. International cooperation in the peaceful uses of outer space, GA Res 1802, 17th Sess, UN Doc A/Res/1802 (1962).

------. International Cooperation In the peaceful uses of outer space, GA Res 1721, 16th Sess, UN DOC A/Res/1721 (1961).

------. International Cooperation in the peaceful uses of outer space, GA Res 1472, 14th Sess, UN Doc A/Res/1472 (1959).

——. United Nations Conference on the Human Environment, GA Res 2994, 27th Sess, UN Doc A/RES/2994 (1972).

------. 1085th Plen Mtg, Res/1721/B/(XVI) (1961).

UNC4OR. 67th GA, 9th Mtg, UN Doc GA/SPD/511 (18 October 2012).

UNSCOR. 39th Sess, 2546th Mtg, UN Doc S/PV.2546 (1 June 1984).

## LEGISLATION

US, Security Control of Air Traffic. 14 CFR Part 99 (2015).

US, Sovereignty and Use of Airspace. 49 USC § 40103(b)(2) (1994).

US, The Federal Aviation Act of 1958. Pub L No 85-726, 72 Stat 731.

#### GOVERNMENT DOCUMENTS

- Association of Southeast Asian Nations. "Joint Statement of the ASEAN-Japan Commemorative Summit 'Hand in hand, facing regional and global challenges'" (15 December 2013).
- Australian Defence Department. Defence Doctrine Publication, *Executive Series: Law of Armed Conflict* (ADDP 06.4) (11 May 2006).
- Australian Ministry of Foreign Affairs. News Release, "China's announcement of an air-defense identification zone over the East China Sea" (26 November 2013).
- Chinese Ministry of National Defense. Public Announcement, "Announcement of the Aircraft Identification Rules for the East China Sea Air Defense Identification Zone of the People's Republic of China" (23 November 2013), online: Official News Agency of the People's Republic of China – Xinhuanet <a href="http://news.xinhuanet.com/english/china/2013-11/23/c\_132911634.htm">http://news.xinhuanet.com/english/china/2013-11/23/c\_132911634.htm</a>.
- European Space Agency. Clean Space One Project, "How Many Space Debris Objects are Currently in Orbit" (Last update 25 July 2013), online: <a href="http://m.esa.int/Our\_Activities/Space\_Engineering\_Technology/Clean\_Space/How\_ma">http://m.esa.int/Our\_Activities/Space\_Engineering\_Technology/Clean\_Space/How\_ma</a> ny\_space\_debris\_objects\_are\_currently\_in\_orbit>.
- Garcia, Mark, ed. "Space Debris and Human Scpacecraft" (27 July 2016), online: NASA <a href="https://www.nasa.gov/mission\_pages/station/news/orbital\_debris.html">www.nasa.gov/mission\_pages/station/news/orbital\_debris.html</a>>.
- Imperial Ordinance No 11 (23 January 1904), reprinted in US Naval War College International Law Studies, *International Law Situations with Solutions and Notes*, vol 12 (Washington, DC: US Naval War College, 1912).

Jacques, Richard, ed. Maritime Operational Zones (Newport, RI: US Naval War College, 2013).

- Japan Ministry of Foreign Affairs. Press Release, "Statement by the Minister of Foreign Affairs on the announcement of the 'East China Sea Air Defense Identification Zone' by the Ministry of National Defense of the People's Republic of China" (24 November 2013).
- Kan, Shirly. Congressional Research Service, *CRS Report for Congress: China's Anti-Satellite Weapon Test* (2007), online: <a href="https://www.fas.org/sgp/crs/row/RS22652.pdf">https://www.fas.org/sgp/crs/row/RS22652.pdf</a> >.
- NASA. "Restore-L Fact Sheet", online: <a href="http://ssco.gsfc.nasa.gov/images/Restore\_L\_Factsheet\_030916\_02.pdf">http://ssco.gsfc.nasa.gov/images/Restore\_L\_Factsheet\_030916\_02.pdf</a>>.

Statement of President Johnson. 55 Department of State Bulletin (8 December1966) at 952.

The Declaration of the First Meeting of the Equatorial States, Bogotá, (1978) 6 J Sp L 193.

- UK Embassy Tokyo. News Release, "European Union declaration on the establishment by China of an 'East China Sea Air Defence Identification Zone" (28 November 2013).
- US Air Force. *AU-18 Space Primer*, 2 ed (Air University Press: Maxwell Air Force Base, Alabama, 2009).

- US-China Economic and Security Review Commission. "Air Defense Identification Zone Intended to Provide China Greater Flexibility to Enforce East China Sea Claims" (2014), online: <www.uscc.gov/sites/default/files/Research/China%20ADIZ%20Staff%20Report.PDF>.
- US Congress. Commercial Space: Hearing Before the Subcommittee On Space, Committee on Science, Space, and Technology, House of Representatives, 113th Cong (20 November 2013).

------. Commission on Integrated Long-Term Strategy, *Discriminate Deterrence: Report of the Commission on Integrated Long-Term Strategy*, (January 1988), online:

<http://usacac.army.mil/cac2/CSI/docs/Gorman/06\_Retired/01\_Retired\_1985\_90/26\_88\_ IntegratedLongTermStrategy\_Commission/01\_88\_DiscriminateDeterrence\_Jan.pdf>.

—. Office of Technology Assessment, Anti-Satellite Weapons, Countermeasures, and Armed Control (OTA – 1.S – 281) (Washington, DC: US Government Printing Office, September 1985).

- US Defense Advanced Research Projects Agency. "Program Aims to Facilitate Robotic Servicing of Geosynchronous Satellites" (15 Mar 2016), online: <www.darpa.mil/newsevents/2016-03-25>.
- US Department of Defense. Asia-Pacific Maritime Security Strategy: Achieving U.S. National Security Objectives in a Changing Environment (14 Aug 2015).
  - ------. Soviet Military Power, 4th ed (Washington, DC: US Government Printing Office, April 1985).

———. *Space Operations*, Joint Publication 3-14 (29 May 2013).

- US Department of State, *Diplomatic Correspondence with Belligerent Governments Relating to Neutral Rights and Commerce* (Washington, DC: Government Printing Office, 1915).
- US Federal Aviation Administration. Aeronautics and Space Definitions, 14 CFR § 99.3 (2015).
- US Navy. NWP 1-14M, *The Commander's Handbook on the Law of Naval Operations* (Newport, RI: Navy Warfare Library, July 2007).
- US Naval War College International Law Studies. *International Law Situations with Solutions and Notes*, vol 12 (Washington, DC: US Naval War College, 1912).

------. International Law Documents 1943, vol 43 (Washington, DC: US Naval War College, 1945).

- US Office of the Secretary of Defense. Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2015 (Washington, DC: US Government Printing Office, 2015).
  - ———. Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2012 (Washington, DC: US Government Printing Office, 2012).

------. Formal Investigation into the Circumstances Surrounding the Downing of Iran Air Flight 655 on 3 July 1988 (28 July 1988).

- US Strategic Command. "Joint Functional Component Command for Space (JFCC Space)" (December 2011), online: USSTRATCOM Factsheets <www.stratcom.mil/factsheets/7/JFCC\_Space/>.
- US White House. *Cyberspace Policy Review* (2009), online: <www.whitehouse.gov/assets/documents/Cyberspace Policy Review final.pdf>.

 International Strategy for Cyberspace Prosperity, Security, and Openness in a Networked World (2011), online:
<www.whitehouse.gov/sites//default/files/rss\_viewer/international\_strategy\_for\_cyberspa ce.pdf>.

#### BOOKS

- Bilstein, Roger E. *Flight in America: From the Wrights to the Astronauts*, 3rd ed (Baltimore: John Hopkins University Press, 2001).
- Bowett, D.W. Self-Defense in International Law (New York: Praeger, 1958).
- Cheng, Bin. *Studies in International Space Law* (Oxford: Clarendon Press; Oxford University Press, 1997).
- Christol, Carl Q., ed. *Space Law: Past, Present, and Future* (Deventer, The Netherlands: Kluwer, 1991).
- Contant-Jorgenson, Corinne, Peter Lala, & Kai-Uwe Schrogl, eds. *Cosmic Study on Space Traffic Management* (Paris, France: International Academy of Astronautics, 2006).
- Diederiks-Verschoor, I.H.Ph. & Vladimar Kopal, *An Introduction to Space Law* (The Netherlands: Kluwer Law International, 2008).
- Dinstein, Yoram. *War, Aggression and Self-Defense*, 3rd ed (Cambridge: Cambridge University Press, 2001).
- Doswald-Beck, Louise, ed. San Remo Manual on International Law Applicable to Armed Conflicts at Sea (Cambridge: Cambridge University Press, 1995).
- Fawcett, J.E.S. *International Law and the Use of Outer Space* (Manchester, UK: Manchester University Press, 1968).
- Gal, Gyula. Space Law (Leyden/Dobbs Ferry, NY: Sijthoff/Oceana, 1969).
- Garner, James. International Law and the World War (New York: Longsman, Green, & Co, 1920).

- Goldsmith, Jack & Tim Wu. *Who Controls the Internet?: Illusions of a Borderless World* (Oxford: Oxford University Press, 2006).
- Gray, Christin. International Law and the Use of Force (Oxford: Oxford University Press, 2000).
- Green, Leslie C. *The Contemporary Law of Armed Conflict*, 3rd ed (Manchester, UK: Manchester University Press, 2008).
- Hurwitz, Bruce A. *The Legality of Space Militarization*, (Amsterdam: Elsevier Science Publishers B.V., 1986).
- Jacques, Richard, ed. Maritime Operational Zones (Newport, RI: US Naval War College, 2013).
- Jenks, C. Wilford. *Liability for Ultra-Hazardous Activities in International Law*, vol 117 (Leiden, The Netherlands: Brill Nijhoff, 1966).
- Klein, Natalie. *Maritime Security and the Law of the Sea* (Oxford: Oxford University Press, 2011).
- Krepon, Michael & Christopher Clary. Space Assurance or Space Dominance? The Case Against Weaponizing Space (Washington, DC: The Henry L. Stimson Center, 2003).
- Lachs, Manfred. *The Law of Outer Space: An Experience in Contemporary Law-Making* (Leiden: Martinus Nijhoff Publishers, 2010).
- Lessig, Lawrence. Code: Version 2.0 (New York: Basic Books, 2006).
- Lyall, Francis & Paul B. Larsen, *Space Law: A Treatise* (Surrey, England: Ashgate Publishing, 2009).
- MacFarlane, S. Neil & Yuen Foong Khong. *Human Security and the UN: A Critical History* (Bloomington, IN: Indiana University Press, 2006).
- Malanczuk, Peter. *Akehurst's Modern Introduction to International Law*, 7th ed (London: Routledge, 1997).
- Matte, Nicolas M., ed. *Space Activities and Emerging International Law* (Montreal: Centre for Research of Air & Space Law, McGill University, 1984).
- Metcalf, Katrin Nyman. Activities in Space Appropriation or Use? (Uppsala, Sweden: Iustug Förlag, 1999).
- Moltz, James Clay. Crowded Orbits: Conflict and Cooperation in Space, (Columbia University, New York, 2014).

- Mowthorpe, Matthew. *The Militarization and Weaponization of Space* (Lanham, MD: Lexington Books, 2004).
- O'Connell, Daniel P. *The Influence of Law on Sea Power* (Manchester: Manchester University Press, 1975).

——. *The International Law of the Sea*, vol 2 (Oxford: Clarendon Press, 1984).

- Paulsen, Marjorie P., ed. Law of the Sea (New York: Nova Science Publishers, 2007).
- Schmitt, Michael N. *Tallinn Manual on the International Law Applicable to Cyber Warfare* (New York: Cambridge University Press, 2013).

Shaw, Malcom M. International Law, 6th ed (Cambridge: Cambridge University Press, 2008).

Stone, Julius. Legal Controls of International Conflict: A Treatise on the Dynamics of Disputes and War Law (New York: Rinehart, 1954).

#### JOURNAL ARTICLES AND BOOK SECTIONS

- Abeyratne, Ruwantissa. "In Search of a Theoretical Justification for Air Defense Identification Zones" (2012) 5:1 J Transp Sec 87.
- Almond, Roncevert. "Clearing the Air Above the East China Sea: the Primary Elements of Aircraft Defense Identification Zones" (2015) 7:1 Harv Natl Sec J 126.
- Anand, Ram P. "Freedom of the Seas: Past, Present, and Future" in Hugo Caminos, ed, *Law of the Sea*, (Hants, UK: Dartmouth Publishing, 2001).
- Bateman, Sam. "Security and the Law of the Sea in East Asia: Navigational Regimes and Exclusive Economic Zones" in David Freestone, Richard Barnes & David M. Ong, eds, *The Law of the Sea: Progress and Prospects* (Oxford: Oxford University Press, 2006).
- Bellamy, Alex J. & Matt McDonald. "The Utility of Human Security: Which Humans? What Security? A Reply to Thomas and Tow" (2002) 33:3 Security Dialogue 373.
- Benkler, Yochai. "From Consumer to Users: Shifting the Deeper Structures of Regulation Toward Sustainable commons and User Access" (2000) 52:3 Fed Comm LJ 561.
- Bittlinger, Horst. "'Keep-Out Zones' and the Non-Appropriation Principle of International Space Law" (1988) 31 Proc on L Outer Sp 6.
- Bradford, John F. "Japanese Anti-Piracy Initiatives in Southeast Asia: Policy Formulation and the Coastal State Responses" (2004) 26:3 Contemporary SE Asia J 480.

Brock, John R. "Legality of Warning Areas as Used by US" (1966-67) 21:3 JAG J 69.

- Brownlie, Ian. "The Maintenance of International Peace and Security in Outer Space" (1964) 40 Brit YB Intl L 1.
- Cepelka, Cestmir & Jamie H. Gilmour. "The Application of General International Law in Outer Space" (1970) 36 Air L & Comm 30.

Chandrasekharan, Sudhaker. "The Space Treaty" (1967) 7 Indian J Intl L 61 at 63.

- Cheli, Simonetta. "Cooperation in Space" in Christian Brünner & Alexander Soucek, eds, *Outer Space in Society, Politics, and Law* (New York: SpringerWienNewYork, 2011).
- Dalbello, Richard. "Rules of the Road: Legal Measure to Strengthen the Peaceful Uses of Outer Space" (1985) 28 Proc on L Outer Sp 8.
- DeSaussure, Hamilton. "The Freedoms of Outer Space and Their Maritime Antecedents" in Nandasiri Jasentuliyana, ed, *Space Law: Development and Scope* (Westport, CT: Praeger Publishers, 1992).
- Dudakov, B.G. "On the International Legal Status of Artificial Earth Satellites and the Zones Adjacent to Them" (1981) 24 Proc on L Outer Sp 97.
- Eichensehr, Kristin E. "The Cyber-Law of Nations" (2014-15) 103:1 Geo LJ 317.
- Fasan, Ernst. "The Meaning of the Term 'Mankind' in Space Legal Language" (1974) 2 J Sp L 125.
- Filho, José Monserrat. "Space Traffic Management: Comparative Institutional Aspects" (2002) 45 Proc on L Outer Sp 487.
- Fleck, Dieter. "Individual and State Responsibility for Intelligence Gathering" (2007) 28:3 Mich J Intl L 687 at 690.
- Franzese, Patrick W. "Sovereignty in Cyberspace: Can It Exist?" (2009) 64 AFLR 1.
- Goldie, L.F.E. "Maritime War Zones & Exclusion Zones" (1991) 64 Intl L Stud 156.
- Goodman, John L. "History of Space Shuttle Rendezvous and Proximity Operations" (2006) 43:5 J Spacecraft & Rockets 944.
- Grego, Laura. "Technologies and Behaviors of Concern: What Threatens Long-Term Space Security and How Can These Threats be Monitored?" in UN Institute for Disarmament Research, Building the Architecture for Sustainable Space Security: Conf Rep 30-31 March 2006 (UN Publications, Geneva, 2006).

- Liou, J.C., & N.L. Johnson. "A Sensitivity Study of the Effectiveness of Active Debris Removal in LEO", (2008) 64:3 Acta Astronautica 236.
  - ———. "Instability of the Present LEO Satellite Populations" (2008) 41:7 Advances in Sp Research 1047.
- Hays, Peter L. "Space Law and the Advancement of Spacepower" in Charles D. Lutes & Peter L. Hays, eds, *Toward a Theory of Spacepower: Selected Essays* (Washington, DC: Institute for National Strategic Studies, 2011).
- Hobe, Stephen. "Outer Space as the Province of Mankind An Assessment of 40 Years of Development" (2007) 50 Proc on L Outer Sp 442.
- Jakhu, Ram S. "Regulatory Process for Communications Satellite Radio Frequencies" in Joseph N. Pelton, Scott Madry, & Sergio Camacho Lara, eds, *The Handbook of Satellite Applications* (New York: Springer Science & Business Media, 2013).
- Jakhu, Ram S. & Karan Singh. "Space Security and Competition for Radio Frequencies and Geostationary Slots" (2009) 58 ZLW 74.
- Khan, Daniel-Erasmus. "Territory and Boundaries" in Bardo Fassbender, et al, eds, *The Oxford Handbook of the History of International Law* (Oxford: Oxford University Press, 2012).
- King, Matthew T. Sovereignty's Gray Area: The Delimitation of Air and Space in the Context of Aerospace Vehicles and the Use of Force (LLM Thesis, McGill University Institute of Air and Space Law, 2015) [unpublished].
- Klein, Natalie. "Legal Implications of Australia's Maritime Identification System" (2006) 55:2 ICLQ 337.
- ———. "Legal Limitations on Ensuring Australia's Maritime Security" (2006) 7 Melbourne UL Rev 306.
- Krepon, Michael & Michael Katz-Hyman, "Space Weapons and Proliferation" in UN Institute for Disarmament Research, *Building the Architecture for Sustainable Space Security: Conference Report 30-31 March 2006* (UN Publications, Geneva, 2006).
- Krepon, Michael & Sonya Schoenberger, "A Comparison of Nuclear and Anti-Satellite Testing, 1945-2013" in Michael Krepon & Julia Thompson, eds, *Anti-Satellite Weapons, Deterrence and Sino-American Space Relations* (Washington, DC: Stimson Foundation, 2013).
- Kopal, Vladimir. "Origins of space law and the role of the United Nations" in Christian Brünner & Alexander Soucek, eds, *Outer Space in Society, Politics, and Law* (New York: SpringerWienNewYork, 2011).

- Lamont, Christopher K. "Conflict in the Skies: The Law of Air Defence Identification Zones" (2014) 39:3 Air & Sp L 187.
- Larsen, Paul B. "Asteroid Legal Regime: Time for a Change?" (2014) 39:2 J Space L 275.
- Lazarev, M.I. "Future Space Cities (International Legal Aspects)" (1980) 5 Ann Air & Sp L 529.
- Leiner, Frederick C. "Maritime Security Zones: Prohibited Yet Perpetuated" (1983-84) 24:4 Va J Intl L 967.
- Mack, Andrew. "Security Regimes for the Oceans: The Tragedy of the Commons, the Security Dilemma and Common Security" in Jon M. Van Dyke, Durwood Zaelke, & Grant Hewison, eds, *Freedom of the Seas in the 21st Century: Ocean governance and Environmental Harmony* (Washington, DC: Island Press, 1993).
- Mankiewicz, Rene H. "Some Thoughts on Law and Public Order in Space" (1964) Can YB Intl Law 258.
- Maogoto, Jackson N. & Steven Freeland. "Space Weaponization and the UN Charter Regime on Force: A Thick Legal Fog or a Receding Mist?" (2007) 41 Intl Law 1091.
- Margolis, Emanuel. "The Hydrogen Bomb Tests and International Law" (1955) 64 Yale LJ 629.
- McDougal, Myres S. "The Hydrogen Bomb Tests and the International Law of the Sea", Editorial Comment, (1955) 49 AJIL 3.
- McDougal, Myres S. & Norbert A. Schlei. "The Hydrogen Bomb Tests in Perspective: Lawful Measures for Security" (1955) 64 Yale LJ 648.
- Michaelsen, Christopher. "Maritime Exclusion Zones in Times of Armed Conflict at Sea: Legal Controversies Still Unresolved" (2003) 8:2 J of Conflict & Sec L 363.
- Mountin, Sarah M. "The Legality and Implications of International Interference with Commercial Communication Satellite Signals" (2014) 90 Intl L Stud 101.
- Newman, Edward. "A Normatively Attractive but Analytically Weak Concept" (2004) 35:3 Sec Dialogue 358.
- O'Hanlon, Michael E. "Balancing U.S. Security Interests in Space" in Charles D. Lutes & Peter L. Hays, eds, *Toward a Theory of Space Power: Selected Essays* (Washington, DC: Institute for National Strategic Studies, National Defense University, 2011).

Park, Choon-Ho. "The 50-Mile Military Boundary Zone of North Korea" (1978) 72:4 AJIL 866.

- Pedrozo, Raul. "Military Activities in the Exclusive Economic Zone: East Asia Focus" (2014) 90 Intl L Stud 514.
- . "The Bull in the China Shop: Raising Tensions in the Asia-Pacific Region" (2014) 90:1 Intl L Stud 66.
- Peoples, Columba. "The Securitization of Outer Space: Challenges for Arms Control" (2011) 32:1 Contemporary Sec Pol'y 76.
- Petras, Christopher. "The Law of Air Mobility: The International Legal Principles Behind the U.S. Mobility Air Forces Mission" (2010) 66:1 AFL Rev 1.

------. "Space Force Alpha' Military Use of the International Space Station and the Concept of Peaceful Purposes" (2002) 53 AFL Rev 135.

- Pietsch, Juliet & Ian McAllister. "Human Security in Australia: Public Interest and Political Consequences" (2010) 64:2 Austl J of Intl Aff 225.
- Randelzhofer, Albrecht. "Article 2(4)" in Bruno Simma, et al, eds, *The Charter of the UN: A Commentary*, 2nd ed (Oxford: Oxford University Press, 2002).
- Ramey, Robert A. "Armed Conflict on the Final Frontier: The Law of War in Space" (2000) 48 AFL Rev 1.
- Roberts, David. "Human Security or Human Insecurity? Moving the Debate Forward" (2006) 37:2 Sec Dialogue 249.
- Roberts, Stephen S. "The October 1973 Arab-Israel War" in Bradford Dismukes & James McConnell, eds, *Soviet Naval Diplomacy*, (Pergamon Press, 1979).
- Rothblatt, Martin A. "State Jurisdiction and Control in Outer Space" (1983) 26 Proc on L Outer Sp 135.
- Russell, Malcom. "Military Activities in Outer Space: Soviet Legal Views" (1984) 25 Harv Intl LJ 153.
- Schrogl, Kai-Uwe & Julia Neumann, "Article IV, Outer Space Treaty" in Stephen Hobe, Bernhard Schmidt-Tedd, & Kai-Uwe Schrogl, eds, *Cologne Commentary on Space Law: Outer Space Treaty*, vol 1 (Luxembourg: Carl Heymanns Verlag, 2009).
- Schmitt, Michael N. "International Law and Military Operations in Space" (2006) 10 Max Planck YB of UN L 89.

- Schwetjie, F. Kenneth. "Protecting Space Assets: A Legal Analysis of 'Keep-Out Zones'" (1987) 15:1 J Sp L 131.
- Sheehan, Michael. "Defining Space Security" in Kai-Uwe Schrogl, ed, *Handbook of Space* Security: Policies, Applications and Programs (New York: Springer, 2015).
- Sivakumaran, Sandesh. "Exclusion Zones in the Law of Armed Conflict at Sea: Evolution in Law and Practice" (2016) 92:1 Intl L Stud 153.
- Solum, Lawrence B. & Minn Chung. "The Layers Principle: Internet Architecture and the Law" (2004) 79:3 Notre Dame L Rev 815.
- Stephens, Dale G. "The Impact of the 1982 Law of the Sea Convention on the Conduct of Peacetime Naval/Military" (1998-99) 29:1 Cal W Intl LJ 283.
- Truver, Scott C. "The Law of the Sea and Military use of the Oceans in 2010" (1985) 45:6 La L Rev 1221.
- Tsarev, V.F. "Peaceful Uses of the Sea: Principles and Complexities" (1988) 12:2 Marine Pol'y 153.
- Van Dyke, Jon M. "Military Exclusion and Warning Zones on the High Seas" (1991) 15:3 Marine Pol'y 147.

———. "Military Ships and Planes Operating in the Exclusive Economic Zone of Another Country" (1991) 28:1 Marine Pol'y 29.

- von der Dunk, Frans G. "The Registration Convention: Background and Historical Context" (2003) 46 Proc on L Outer Sp 450
- von Heinegg, Wolff Heintschel. "Current Legal Issues in Maritime Operations: Maritime Interception Operations in the Global War on Terrorism, Exclusion Zones, Hospital Ships, and Maritime Neutrality" (2006) 80:1 Intl L Stud 207.
- Waldrop, Elizabeth S. "Integration of Military and Civilian Space Assets: Legal and National Security Implications" (LLM Thesis, McGill University Institute of Air and Space Law, 2003).

#### NEWSPAPERS AND ONLINE NEWS ARTICLES

"Captain's Radio Chat Averted Near-Collision between Liaoning, USS Cowpens" *South China Morning Post*, (17 December 2013), online: <a href="http://article.wn.com/view/2013/12/17/Captains\_radio\_chat\_averted\_nearcollision\_betw">http://article.wn.com/view/2013/12/17/Captains\_radio\_chat\_averted\_nearcollision\_betw</a> een Liaoning U/>.

- Forden, Geoffrey. "After China's Test: Time for a Limited Ban on Anti-Satellite Weapons" (April 2007) 37 Arms Control Today 19, online: <a href="http://legacy.armscontrol.org/act/2007\_04/Forden">http://legacy.armscontrol.org/act/2007\_04/Forden</a>>.
- Foust, Jeff. "Orbital ATK signs Intelsat as first satellite servicing customer", *SPACENEWS* (12 April 2016), online: <a href="http://spacenews.com/orbital-atk-signs-intelsat-as-first-satellite-servicing-customer">http://spacenews.com/orbital-atk-signs-intelsat-as-first-satellite-servicing-customer</a>>.
- Gertz, Bill. "Chinese Warning a Day Late" The Washington Times (16 January 2014) A-10.
- Gruss, Mike. "Fresh Eyes", *SpaceNews Magazine* (23 May 2016), online: <a href="https://www.spacenewsmag.com/feature/fresh-eyes/">www.spacenewsmag.com/feature/fresh-eyes/</a>>.

- Iannotta, Becky & Tariq Malik. "US Satellite Destroyed in Space Collision", *Space.com* (11 February 2009), online: <www.space.com/5542-satellite-destroyed-space-collision.html>.
- Kolcum, Edward H. "Soviet Intelligence Ship Intrudes on Trident Test", *Aviation Weekly* (25 January 1982) at 21, online: <a href="http://archive.aviationweek.com/issue/19820125#!&pid=20">http://archive.aviationweek.com/issue/19820125#!&pid=20</a>.
- Mackey, James. "Recent US and Chinese Antisatellite Activities" *Air & Sp Power J* (1 September 2009), online: <www.au.af.mil/au/afri/aspj/airchronicles/apj/apj09/fal09/mackey.html>.
- Peter, Laurence. "Russia Shrugs off US anxiety over military satellite", *BBC News* (20 October 2015), online: <www.bbc.com/news/world-europe-34581>.
- Schmalz, Jeffrey. "After Skirmish with Protesters, Navy Tests Missile" *New York Times* (5 December 1989) B18, online: <<a href="https://www.nytimes.com/1989/12/05/us/after-skirmish-with-protesters-navy-tests-missile.html">www.nytimes.com/1989/12/05/us/after-skirmish-with-protesters-navy-tests-missile.html</a>>.
- Schmemann, Serge. "British War Zones Called Unlawful in Soviet Protest", *New York Times* (15 May 1982), online: <www.nytimes.com/1982/05/15/world/british-war-zones-called-unlawful-in-soviet-protest.html>.
- Schmidt-Tedd, Bernhard & Michael Gerhard. "Registration of Space Objects: Which are the Advantages for States Resulting from Registration?" in Marietta Benkö & Kai-Uwe Schrogl, eds, *Space Law: Current Problems and Perspectives for Future Regulation* (Utrecht, Netherlands: Eleven Intl Publishing, 2005).

Weeden, Brian. "Dancing in the dark redux: Recent Russian Rendezvous and proximity operations in space" (5 October 2015) *The Space Review*, online: <a href="https://www.thespacereview.com/article/2839/1">www.thespacereview.com/article/2839/1</a>>.

------. "Dancing in the Dark: The Orbital Rendezvous of SJ-12 and SJ-06F", *The Space Review* (30 August 2010), online: <</www.thespacereview.com/article/1689/1>.

Zappone, Chris. "Luch/Olymp rogue Russian satellite symbolises new worries about space peace", *The Sydney Morning Herald* (24 November 2015), online: <www.smh.com.au/technology/sci-tech/lucholymp-rogue-russian-satellite-symbolisesnew-worries-about-space-peace-20151122-gl59of.html>.

MISCELLANEOUS (PRESENTATIONS, WEBPAGES, OTHER)

- Banner, Abraham Franz. "Spacecraft Proximity Operations Used to Estimate the Dynamic & Physical Properties of a Resident Space Object" (Masters Aerospace Engineering, Air University, 2007) [unpublished] at 2, online: <www.dtic.mil/dtic/tr/fulltext/u2/a469281.pdf>.
- Barack Obama 2008. "Barack Obama: Advancing the Frontiers of Space Exploration", Policy Statement (16 August 2008), online: <www.spaceref.com/news/viewsr.html?pid=28880>.
- Carrico, Timothy, et al. "Proximity Operations for Space Situational Awareness: Spacecraft Closed-Loop Maneuvering Using Numerical Simulations and Fuzzy Logic" (Paper delivered at the Advanced Maui Optical and Space Surveillance Technologies Conference, September 2006), online: <www.centerforspace.com/downloads/files/pubs/AMOS-2006.pdf>.
- David, Leonard. "Who Owns the Asteroids? Space Mining Project Raises Legal Questions", *Space.com* (10 July 2012), online: <www.space.com/1615-space-mining-asteroid-legalissues.html>.
- Doyle, Stephen. "A Concise History of Space Law: 1910-2009" (Nandasiri Jasentuliyana Keynote Address on Space Law delivered at the Proceedings of the 53rd Colloquium on the Law of Outer Space, France, 2010), 53 Proc Intl Inst Sp L 3.
- Encyclopedia Britannica Online. "Intelsat", (Accessed on 25 May 2016) online: <a href="https://www.britannica.com/topic/Intelsat">www.britannica.com/topic/Intelsat</a>>.
- Goehring, John. "Public-Private Partnerships and On-Orbit Satellite Servicing: Select Legal Issues" (2015) [unpublished, paper on file with the author].
- Grego, Laura. "A History of Anti-Satellite Programs" (January 2012), online: Union of Concerned Scientists, online:

<www.ucsusa.org/sites/default/files/legacy/assets/documents/nwgs/a-history-of-ASAT-programs\_lo-res.pdf>.

- Haney, Cecil D., Admiral, Commander USSTRATCOM. (Speech delivered at 32nd Space Symposium, Colorado Springs, CO, 14 April 2016) [unpublished], online: <a href="https://www.stratcom.mil/speeches/2016/169/32nd\_Space\_Symposium/printable">https://www.stratcom.mil/speeches/2016/169/32nd\_Space\_Symposium/printable</a>>.
- Hyatt, James L., et al. "Space Power 2010" (1995) [unpublished], online: <a href="https://fas.org/spp/eprint/95-010e.pdf">https://fas.org/spp/eprint/95-010e.pdf</a>>.
- International Telecommunications Union. "Signatories of the Final Acts: 89," online: <a href="https://www.itu.int/osg/wcit-12/highlights/signatories.html">www.itu.int/osg/wcit-12/highlights/signatories.html</a>>.
- Interview of General John Hyten, Commander AFPSC, by David Martin (26 April 2015) on 60 Minutes, CBS News, transcript available online: </www.spacenews.com/transcript-of-60minutes-air-force-space-command-segment/>.
- Jakhu, Ram S. & Yaw Nyampong. "Some Legal and Regulatory Constraints on the Conduct of Active Debris Removal and On-Orbit Satellite Servicing" (Paper delivered at the 63rd Astronautical Congress, Naples Italy, 2012) [unpublished].
- Jakhu, Ram S., Bhupendra Jasani, & Jonathan McDowell, "Challenges in International Registration of Space Objects" (Paper, delivered at the International Conference on New Challenges in Space Law on "The Space Treaties at the Crossroads: Consideration for de lege ferenda", Athens, Greece, 28 August 2015).
- Meek, Phlip A. "Strategic (Military) Implications of Active Debris Removal (ADR) and On-Orbit Satellite Servicing (OOS)", Lecture Notes (Visiting Lecturer, Institute of Air & Space Law, McGill University, 11 November 2011) at 10, online: <a href="https://www.mcgill.ca/iasl/files/iasl/sdc2011">https://www.mcgill.ca/iasl/files/iasl/sdc2011</a> 32 meek.pdf>.
- Oxford English Dictionary Online. "Cyberspace" (June 2016), online: <www.oed.com/view/Entry/240849?redirectedFrom=cyberspace#eid>.
- Oxford English Dictionary Online. "Free fire zone" (July 2016), online: <www.oxforddictionaries.com/definition/american\_english/free-fire-zone>.
- Oxford English Dictionary Online. "Internet" (June 2016), online: <www.oed.com/view/Entry/248411?isAdvanced=false&result=1&rskey=VCqLVq&>.
- Parek, See L. "Traffic Rules on Outer Space" (Paper delivered at the Proceedings of the 25th Colloquium on the Law of Outer Space, Paris, France, 27 October 1982).
- Quayle, Dan. "Making War Less Attractive: Space Self-Defense Zones", Editorial, *The Christian Science Monitor* (24 March 1986), online: <www.csmonitor.com/1986/0324/espace.html>.

- Weeden, Brian, et al. "International Perspectives on On-orbit Satellite Servicing and Active Debris Removal and Recommendations for a Sustainable Path Forward" (Paper delivered at the 64th International Astronautical Congress, Beijing, China, 23 September 2013).
- Wohlstetter, Albert & Brian Chow. "Self-Defense Zones in Space" (July 1986) [unpublished], online: <www.albertwohlstetter.com>.