

US INTERPRETATION OF INTERNATIONAL SPACE POLICIES  
REGARDING COMMERCIAL RESOURCE ACQUISITIONS

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MASTER OF MILITARY ART AND SCIENCE  
Military Space

by

JEFFREY G. ANDERSON, MAJ, U.S. ARMY  
B.A., Brigham Young University, Provo, Utah, 2007

Fort Leavenworth, Kansas  
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Name of Candidate: MAJ Jeffrey G. Anderson

Thesis Title: US Interpretation of International Space Policies Regarding Commercial Resource Acquisitions

Approved by:

\_\_\_\_\_, Thesis Committee Chair  
MAJ Kenneth C. Rich, Ph.D.

\_\_\_\_\_, Member  
LTC Gregory K. Sharpe, M.A.

\_\_\_\_\_, Member  
Michael T. Chychota, M.A.

Accepted this 12th day of June 2015 by:

\_\_\_\_\_, Director, Graduate Degree Programs  
Robert F. Baumann, Ph.D.

The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

## ABSTRACT

U.S. INTERPRETATION OF INTERNATIONAL SPACE POLICIES REGARDING COMMERCIAL RESOURCE ACQUISITIONS, by MAJ Jeffrey G. Anderson, 107 pages.

Within the next 5 to 10 years commercial corporations will begin exploratory mining operations on asteroids orbiting the earth. While this is a huge leap forward in human development and technological advancement, current national regulation and law providing mining rights in space do not exist. International treaties and recognized space law, in regards to commercial collection and exploitation of resources, is vague and leaves a great deal to interpretation. The purpose of this comparative case study is to determine how the US interprets what is known as 'Common Access Areas,' or those areas outside of national jurisdictional authority, in regards to commercial mining operations. The study is meant to identify if legal precedent exists in similar areas that will either allow the U.S. to continue commercial mining in space without international clarification, or if precedent indicates that international accord must met.

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My hope is this document lays a solid foundation for understanding the difficulties the U.S. faces regarding future commercial resource collection in space while providing historical, legal, background of U.S. actions that directly impact today's space policy.

Finally, this project would not have been possible with the support of my wife, Emily, my father, Garth, and my recently deceased mother, Vickie, who still remains my biggest fan. Their support and dedication through a challenging year are what inspired me to finish this thesis.

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## ACRONYMS

ASTEROIDS	The American Space Technology for Exploring Resource Opportunities in Deep Space Act
CGSC	Command and General Staff College.
COPUOS	Committee on the Peaceful Uses of Outer Space
FAA	Federal Aviation Authority
ISR	Intelligence, Surveillance, Reconnaissance
ISRU	In Situ Resource Utilization
NAS	National Aeronautics and Space
NEO	Near Earth Objects
OOSA	Office of Outer Space Affairs
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNOOSA	United Nations Office for Outer Space Affairs
U.S.	United States
U.S.S.R.	The United Soviet Socialist Republic

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## CHAPTER 1

### INTRODUCTION

A hallmark of United States national space law is that it tends to follow the development of space technology and geopolitical events. Technology that develops into applications tends to catalyze law that addresses the commercialization of the technology.<sup>1</sup>

— Joanne Irene Gabrynowicz, “One-Half Century and Counting”

#### Overview

Since the launch of the Union of Soviet Socialist Republics (U.S.S.R.) Sputnik I on October 4, 1957 the United States (U.S.) has led the international effort to bring into existence globally accepted laws to regulate space endeavors. The existing void of space regulation was first addressed in 1958 with the introduction of the National Aeronautics and Space (NAS) Act within the U.S.<sup>2</sup> Shortly after the U.S. passed the NAS Act the United Nations (UN) created the Committee on the Peaceful Uses of Outer Space (COPUOS),<sup>3</sup> whose initial purpose was to find existing analogies, or precedents, to use that would be accepted by the international community as a whole. The primary diplomatic strategy of the U.S. at that time was to prevent the U.S.–U.S.S.R. rivalry from extending into space.<sup>4</sup> The Law of the Sea and Antarctic Treaty ended up being the analogies used for the development of space law as both contained terminology identifying them as areas outside of international jurisdiction, later coined as areas of common access or common heritage of mankind. Since that time the COPUOS has negotiated five international treaties on the use of space, four of which have been signed and ratified by the United States.

Once again the U.S. is introducing a law that has the potential to impact the international community's understanding of space and jurisdictional authorities by means of regulating resource collection activities for commercial use. The American Space Technology for Exploring Resource Opportunities in Deep Space Act (ASTEROIDS) act was introduced July 2014 in order to “promote the development of a commercial asteroid resources industry for outer space in the United States and to increase the exploration and utilization of asteroid resources in outer space.”<sup>5</sup>

As of yet, there is no agreed upon treaty recognized by the United States that specifically addresses commercial property rights in space. There are other international treaties with common terminology as seen in currently accepted space law, specifically that of identifying areas as common access or common heritage of mankind. These treaties include the United Nations Convention of the Law of the Sea (UNCLOS) and Antarctic Treaty.<sup>6</sup> The primary purpose of this thesis is to compare the similarities and differences between UNCLOS, the Antarctic Treaty, and existing Space Treaties regarding commercial mineral and property rights collected in common access areas designated for ‘The Common Heritage of all Mankind.’ Research will address the links between UNCLOS, the Antarctic Treaty, and Space Law, specifically regarding U.S. commercial mining rights to property outside of national jurisdiction. This thesis will also address how the ASTEROIDS act compares to these similarities.

### Primary Research Question

The purpose of this comparative study is to identify the similarities and differences between current and proposed Space Laws with other international treaties that conceptualize ‘The Common Heritage of all Mankind,’ specifically the UN

Convention on the Law of the Sea (UNCLOS) and the Antarctic Treaties. Emphasis will focus on if the United States has established precedence in historical endorsement of commercial resource acquisition in areas designated outside of international jurisdiction.

### Secondary Research Questions

1. Is there a difference between the definition of Areas of Common Access and the Common Heritage of Mankind?
2. Does precedence exist for U.S. to license commercial entities for commercial mining in open access areas?
3. Both the Antarctic Treaty of 1959, and the foundations of UNCLOS, were used as analogies in the development of the Outer Space Treaty of 1967. Do these common access treaties still remain viable comparisons today regarding space law?
4. Would the currently proposed ASTEROIDS act (if passed into law) indicate the U.S. interpretation of the Outer Space Treaty, specifically that the U.S. retains the right to license commercial entities to mine in space?
5. Would there be a negative response from the international community of the U.S. were to issue commercial mining licenses without further refinement of current space policies?

### Assumptions

The following assumptions are believed to remain true and add relevance to the research project.

Any precedents set by the U.S. authorizing commercial mining in areas designated as ‘Common Heritage for all Mankind,’ or common access areas, relate to the

current dialogue on privatized space resource exploitation. This includes any treaties, policies, or legal actions taken by the U.S. within areas outside of international jurisdiction.

### Definitions

Civil Law: Roman law especially as set forth in the Justinian code; The body of private law developed from Roman law and used in Louisiana and in many countries outside the English-speaking world: The law established by a nation or state for its own jurisdiction; The law of civil or private rights.<sup>7</sup>

Commercial: The term commercial has different meanings throughout the international community. For the purpose of this paper the commercial mirror's the 2010 US National Space Policy definition and refers to space goods, services, or activities provided by private sector enterprises that bear a reasonable portion of the investment risk and responsibility for the activity, operate in accordance with typical market-based incentives for controlling cost and optimizing return on investment, and have the legal capacity to offer these goods or services to existing or potential nongovernmental customers.<sup>8</sup>

Common Law: The body of law developed in England primarily from judicial decisions based on custom and precedent, unwritten in statute or code, and constituting the basis of the English legal system and of the system in all of the United States except Louisiana.<sup>9</sup>

Precedent: Within U.S. common law, precedent is defined as a “court decision that is cited as an example or analogy to resolve similar questions of law in later cases.”<sup>10</sup>

### Limitations

The ASTEROIDS act is new legislation and covers an area that has been speculated by the legal and scientific communities, but has recently been introduced as a bill within congress. Most analysis will be speculative in nature with some limited case studies of government resource collection efforts in space. Additionally, subject matter expertise is limited to individuals versed in space law and the entrepreneurs pursuing the mining of resources in space.

### Delimitations

Time is the biggest constraint as research and inquiries into this paper will be conducted primarily from November 2014 through March 2015. Additionally, as this research will be primarily a qualitative case study using a survey will be submitted to recognized authorities on space law to garner information to be used in a thematic research approach. This method strongly relies on voluntary civilian support to the subject matter.

### Conclusion

This study explores possible implications of U.S. precedents established in UNCLOS and the Antarctic Treaty, and how they compare to current space law. The literature review will focus on current national, and international, laws regarding common access areas and commercial mining, specifically in regards to how the United States protects private organizations property rights in areas that are not claimable by national authorities. Additionally, the review will cover strategic interests in asteroid mining, specifically the desired outcome of both private and government industry, as well

as how access to these resources may affect the international community. An explanation of the methodology used in the research will be described in chapter 3.

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<sup>1</sup> Joanne Irene Gabrynowicz, “One-Half Century and Counting: The Evolution of U.S. National Space Law and Three Long-term Emerging Issues,” *Harvard Law and Policy Review* 4 (2010): 405.

<sup>2</sup> National Aeronautics and Space Act of 1958, Public Law 85-568, 72 Stat. 426 (codified as amended at 42 U.S.C. § 2451-84 (2006)).

<sup>3</sup> United Nations Office for Outer Space Affairs, “Committee on the Peaceful Uses of Outer Space: Overview,” accessed January 22, 2015, [http://www.unoosa.org/oosa/en/COPUOS/cop\\_overview.html](http://www.unoosa.org/oosa/en/COPUOS/cop_overview.html).

<sup>4</sup> Gabrynowicz, “One-Half Century and Counting,” 407.

<sup>5</sup> *Hearing before the Congressional Space Subcommittee*, H.R. 5063, The American Space Technology for Exploring Resource Opportunities in Deep Space Act, 113th Cong., (2013-2014), July 10, 2014.

<sup>6</sup> Blake Gibson, “Defending Your Client's Property Rights in Space: A Practical Guide for the Lunar Litigator,” *Fordham Law Review* 80, no. 3 (2011): 1385.

<sup>7</sup> Merriam-Webster, “Civil Law,” accessed January 19, 2015, [http://www.merriam-webster.com/dictionary/civil law](http://www.merriam-webster.com/dictionary/civil%20law).

<sup>8</sup> U.S. President, *Space Policy of the United States of America* (Washington, DC: White House, June 2010), 14.

<sup>9</sup> “Merriam-Webster, “Common Law,” accessed January 19, 2015, [http://www.merriam-webster.com/dictionary/common law](http://www.merriam-webster.com/dictionary/common%20law).

<sup>10</sup> TheFreeDictionary.com, “Precedent,” accessed April 21, 2015, <http://legal-dictionary.thefreedictionary.com/precedent>.

## CHAPTER 2

### TECHNOLOGICAL ACHIEVEMENT AND THE INTERNATIONAL RESPONSE:

#### A LOOK INTO THE CONTINUATION OF EVOLVING SPACE LAW

Before the successful launch of Sputnik I on October 4, 1957, the international community was not concerned with what was considered a realm of science fiction. Speculation was made in the early 1950's on how best to develop international laws and authorities regarding the future exploitation of space.<sup>1</sup> However, very little attention was provided to these recommendations as most administrative officials believed space to be science fiction, and not a viable topic of political concern. The technological advancement that achieved the unthinkable in 1957, the placing of an operational satellite into earth's orbit, brought immediate concerns to the international community as a whole.

With the launch of Sputnik I the international community was faced with the immediate problem of not only what each governing body wanted to achieve with space exploration, but also how best to protect their national interests from potential threats.<sup>2</sup> It may be difficult for our generation to capture the full threat that Sputnik represented. To a war weary world after both World War II and the Korean War, as well as being in the height of the Cold War, this 183 pound satellite represented the capability of dropping atom bombs anywhere on earth from space. There was no defense against such a capability. Within months of Sputniks launch the US responded with the passage of the 1958 NAS Act.

Professor Joanne I. Gabrynowicz notes:

A hallmark of United States national space law is that it tends to follow the development of space technology and geopolitical events. Technology that develops into applications tends to catalyze law that addresses the

commercialization of the technology. After the successful launch of Sputnik I on October 4, 1957, the United States addressed the legal void that then existed for space activities by promulgating its own national law and encouraging the global community to establish space law at the international level.<sup>3</sup>

The development of the NAS Act laid out the United States diplomatic intentions to prevent the U.S.–U.S.S.R. rivalry to extend into space, and is codified by congresses statement that “it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all mankind.”<sup>4</sup> Once this key piece of legislation was passed the U.S. then proposed similar legal recommendations on the use of space to the UN.

#### Common vs Civil Law: Discrepancies within the International Law Framework

A major obstacle in establishing accepted international law are the two globally accepted legal traditions; civil and common law. The majority of countries within the world today follow one of these two traditions, which creates difficulty in settling international legal disputes or establishing common ground for internationally accepted policies. These differing legal traditions throughout the world are contrary enough to cause issues on how to establish international property rights and jurisdictional authorities.<sup>5</sup>

#### Common Law Tradition

The common law tradition is what is used in approximately 80 countries, to include the United States.<sup>6</sup> This tradition is generally uncodified, which means there is no comprehensive compilation of legal statutes. Common law is primarily based off of precedent, or judicial decisions that have previously been made in similar cases. As a

result, judges within the common law systems have tremendous influence in shaping law within their respective countries.<sup>7</sup>

### Civil Law Tradition

Civil law, in contrast to common law, is codified, and is applied in various forms throughout approximately 150 nations.<sup>8</sup> Countries that practice the civil law tradition have comprehensive legal codes specifying the wide range of matters that are capable of being brought to court, applicable procedures, and appropriate punishments. These codes require constant revision and interpretation by legislators and legal scholars, rendering the role of judges less crucial in shaping civil law.<sup>9</sup>

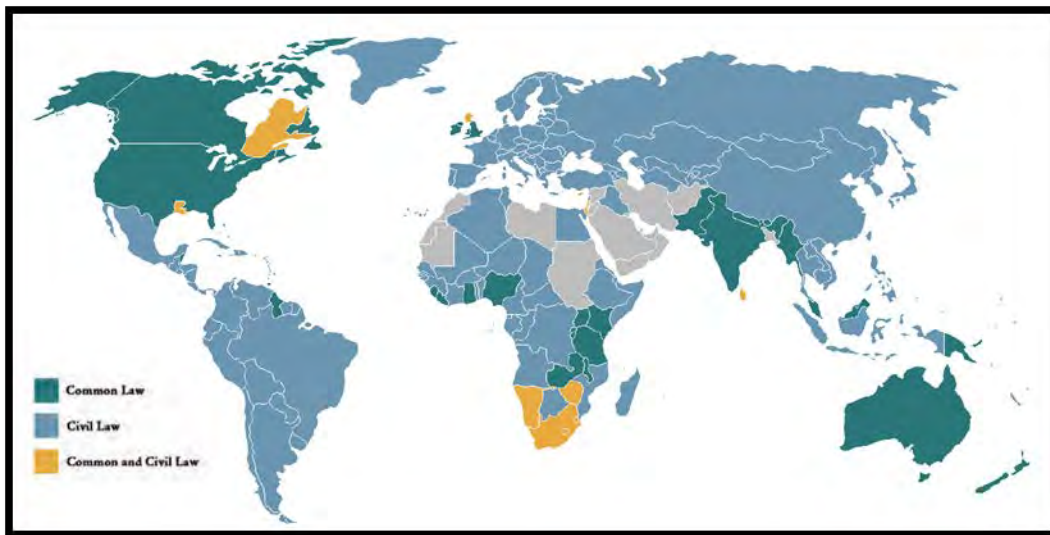


Figure 1. Common Law and Civil Law Traditions

*Source:* The Robins Collection, “The Common Law and Civil Law Traditions” (School of Law, University of California at Berkeley, 2010), 5. Note: Figure 1 is a world map showing countries today that have a civil law system (light blue), countries that have a common law system (green), and countries that have both (orange).

Both systems of law create difficult circumstances when attempting to create common ground in legal concerns on an international scale, property rights being a prime example that will be used later in this study. In civil law tradition, property rights fall within a range of possessory actions and typically regard property as an “indivisible phenomenon of ownership with respect to a thing.”<sup>10</sup> Additionally, under the civil law tradition possession of any unclaimed thing establishes ownership, and may allow recognition of ownership even without territorial sovereignty. Contrast this with common law, where individuals claiming ownership need only prove a superior claim, not an absolute claim to title.<sup>11</sup>

Issues arise when negotiating legal terms and definitions within the international community when working with varied legal systems. Property rights and access being a prime example, as was the circumstance when the world faced the challenging legal battles regarding internally accepted laws for space regulation.

### The Need for Analogies in Developing International Law

In international politics one of the greatest challenges is to establish common ground between two or more nations, especially if differing foundations of law are at odds with the other. This issue can be exacerbated when dealing with multiple nations trying to reach a consensus that meets intentions and goals of all parties involved.

M.J. Peterson notes:

In politics, the shifting of competing analogies is not only an exercise in understanding but also an effort to set the terms of subsequent debate and action. These terms of debate are not politically neutral; they serve as frames that organize perceptions.<sup>12</sup>

The need for designing cooperative treaties amongst nations is a vital process in protecting both U.S. and worldwide interests. In order to achieve accepted cooperation the use of international analogies provide the foundation in establishing common ground and understanding between parties.<sup>13</sup>

### Foundations of Space Law

The former Soviet Union's advancement into space formed many questions and concerns to the rest of the international community. One of these concerns was how to treat outer space. Was it something to be conquered by those who had means to do so, or could it be treated in the manner the United States was pushing for, a benefit for all? Competing ideals and systems of law between nations has always been a difficult obstacle to overcome when working toward developing an international accord. In order to bridge this gap lawmakers work primarily off of previous precedents, or analogies, that have already been accepted within the international community.<sup>14</sup>

In developing an analogy for space law the two world superpowers, the United States and Soviet Union, had differing views. The transnational discussion for outer space activity was debated for years between the analogies of competing high seas and national airspace.<sup>15</sup> The analogy of competing high seas was a predecessor of the UN Convention of the Law of the Sea, and also referred to as simply law of the sea. Each had its advantages and disadvantages.

The adoption of the law of the sea as the foundational analogy for space law would allow each nation state the right govern and police their citizens according to their own laws as long as a widely agreed upon foundation of law is established and is agreed upon by all parties. Furthermore, this analogy would regard space as an open access area

to all nations, which would allow for the greatest autonomy for individual nations to achieve their goals in space while also ensuring rights of safe passage by the international community, who also adheres to these basic principles.<sup>16</sup>

However, the Soviet Union fought against the use of this analogy in the development of space law. While the adoption of the law of the sea analogy as a framework for space law would allow freedom of access for all nations, it would also permit competing nations to place orbital satellites, as well as other objects in space, set to fly over other nations without restriction.<sup>17</sup> Thus providing means for the U.S. to conduct legal Intelligence, Surveillance, and Reconnaissance (ISR) collection over the Soviet Union.<sup>18</sup>

The airspace analogy, which was fought for by the Soviet Union, would treat outer space as something to be divided among the international community, with each segment being governed by the respective government who was responsible to enforce standards there. Additionally, if this analogy were adopted any activity by a separate nation or state would need to gain permissions by the governing authority over the claimed area.<sup>19</sup>

Debate on which analogy to use ended in 1961 with the acceptance of General Assembly Resolution 1721A by all parties.<sup>20</sup> The resolutions two key preliminary agreements established that:

1. International law, including the charter of the United Nations, applies to outer space and celestial bodies.<sup>21</sup>

2. Outer space and celestial bodies are free for the exploration and use by all States in conformity with international law and are not subject to national appropriation.<sup>22</sup>

With the ratification of this resolution the adoption of the high sea's analogy was official. This was mostly due to the then recent adoption of four multilateral treaties in 1958 regarding activities on the oceans whose issues mirrored that of the problems posed with man's exploration into space.

### Law of the Sea and UNCLOS

Since the 17th century the seas had long been subject to the 'freedom-of-the-seas' principle that limited national rights to a three mile narrow strip surrounding a nation's coastline. The remainder of the oceans was declared to be "free to all while belonging to none."<sup>23</sup> While there were claims and disputes throughout the centuries regarding violation of sovereignty, it wasn't until 1945 that the first major challenge to the freedom of the seas doctrine arose with the U.S. claiming jurisdiction over all natural resources on the US continental shelf.<sup>24</sup> Shortly after the U.S. assertion regarding the continental shelf as U.S. property several other nations soon followed suit.

During the 1950s a great deal of international conflict arose worldwide regarding disputed infractions between multiple nations. In 1956 the first UN Convention of the Law of the Sea was held, where multiple principles were derived that apply directly to space law. Four treaties came from this convention, to include the Convention on the Territorial Sea and Contiguous Zone, Convention on the Continental Shelf, Convention on the High Seas, and Convention on Fishing and Conservation of Living Resources of the High Seas.<sup>25</sup> The principles within these treaties, namely defining the high seas as a common

access area with the beginnings terminology that later evolved into the common heritage principle, were vital in developing the foundations of space law.<sup>26</sup>

### Antarctic Treaty

The Antarctic treaty of 1959 was used as an analogy in the development of the Outer Space Treaty for two reasons.<sup>27</sup> First, the treaty resolved disputes between several nations, all of whom claimed Antarctica as their sovereign territory. This treaty, which in effect made Antarctica an open access area, was a perfect analogy to use during the early 1960s in order to prevent either the U.S.S.R. or U.S. in claiming sovereignty of space.<sup>28</sup>

Second, the remoteness of Antarctica can be used as a template to space, outside of international jurisdictional authority and cost prohibitive to exploit.<sup>29</sup> What the Antarctic treaty did not address, that is covered in the law of the sea, is how to regulate mineral exploration or extraction.<sup>30</sup>

### Current Space Laws

US space laws correlate directly with regulation of developing technologies and the current treatise on the use of space, and can be broken down into two separate categories, National Space Law and International Treaties.

#### National Space Laws

Since the implementation of the 1958 NAS Act the U.S. has created multiple laws that regulate both commercial and government activities on space exploration and exploitation.<sup>31</sup> Examples include the 1984 Commercial Space Launch Act delegating authority of commercial and government space launches and re-entry vehicles to the Department of Transportation, specifically the Federal Aviation Authority (FAA). This

act was recently amended in 2004 to include regulation of commercial human spaceflight. This delegation of oversight and regulation is key in order to manage the nuances and possible consequences of space endeavors.<sup>32</sup>

### International Space Treaties

Since the creation of COPUOS in 1959 the United Nations has negotiated five international space treaties through their Office of Outer Space Affairs (OOSA), four of which have been signed and ratified by the U.S.<sup>33</sup> The following paragraphs provide a synopsis of each treaty and indicate the political concerns of the day.

#### Treaty on Principles Governing Activities of States

Better known as the “Outer Space Treaty,” this law entered into force in October 1967 and has been ratified by 102 separate nations and has 26 signatures agreeing to the stipulations outlined therein.<sup>34</sup> This foundational document for the exploration, and use, of space is a tremendous international victory in outlining basic conduct in space.

Basic principles outlined throughout the Outer Space Treaty are as follows:

1. Outer Space, including the moon and other celestial bodies, are for the benefit and use of all mankind. Article I specifically states outer space “shall be the province of all mankind,” terminology that relates specifically to common access areas and the common heritage principle.<sup>35</sup>

2. Outer space and celestial bodies are not subject to appropriation by national claims of sovereignty, use, or military occupation.<sup>36</sup>

3. All space activities, to include the use of the moon and other celestial bodies for peaceful purposes, will be conducted in accordance with international law.<sup>37</sup>

4. Weapons of mass destruction may not be placed in orbit, the moon, or other celestial bodies.<sup>38</sup>

5. States are responsible for supervising and regulating government and private space activities.<sup>39</sup>

6. States retain jurisdiction and control of objects while in space, or on celestial bodies. As such, each state is internationally liable for damages caused to another state, or its citizens, caused by its space objects.<sup>40</sup>

7. States are to carry out their use, and exploration, of space in a manner as to avoid harmful contamination of space, the moon, or other celestial bodies. Additionally, states stations, installations, equipment, or vehicles on the moon or other celestial bodies are open to inspection by other states on a basis of reciprocity.<sup>41</sup>

#### Agreement on the Rescue of Astronauts

Also known as the ‘Astronaut Rescue and Return Agreement,’ which entered into force in December 1968. This treaty elaborates articles V and VIII of the Outer Space treaty, and outlines that nations are to take all possible steps to rescue and assist astronauts in distress, or who have unintentionally landed within another nation’s territory. Additionally, this treaty states that nations are to return objects, or their component parts, to the launching authority of said objects.<sup>42</sup>

#### Convention on International Liability

Known as the ‘Liability Convention,’ which entered into force in September 1972, and covers procedures on presenting and resolving claims for damages caused by

objects falling from space. It also addresses liability for damages caused on earth, on aircraft, or in space itself.<sup>43</sup>

#### Convention on Registration of Objects Launched into Outer Space

Known as the ‘Registration Convention,’ it mandates that nations who launch objects into space must maintain a national register of every item launched into earth’s orbit or beyond.<sup>44</sup>

#### Agreement Governing the Activities of States on the Moon and Other Celestial Bodies

Known as the ‘Moon Agreement,’ this treaty is the most controversial, and remains the only international space treaty where most countries, including the U.S., have not ratified nor signed. Derived from the mostly successful UNCLOS, the moon agreement specifically utilizes the common heritage terminology for the exploration and exploitation of resources in space. As such, any resources mined will not become the property of any state, but must be governed by an international regime created by state parties.<sup>45</sup>

Four of the five treaties are the foundation and structure of current space laws throughout the world, with the moon agreement being the only exception. Each continues to be updated to meet current needs and technological advances. Of the above mentioned international space treatise the Outer Space Treaty and Moon Agreement are the only two treaties that propose regulation of the exploitation of resources in space. The Outer Space Treaty is vague, and states in article VI that “States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and

other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities.”<sup>46</sup>

The Moon Agreement of 1979 attempts to clarify the vagueness of the Outer Space Treaty by detailing regulations governing the exploitation of resources, while appointing an international authority to regulate the exploitation of resources. There are two major flaws with the moon agreement. Currently, no space faring nation to date has ratified this treaty, with only 16 participatory nations.<sup>47</sup> Additionally, there is no method of enforcement regarding the treaty, as other nations with space programs do not recognize, nor enforce, them.

To date, materials collected in space are being used strictly for scientific purposes with the intent of expanding knowledge and furthering exploration. Commercial mining efforts are not specifically addressed within any U.S. space policy, international or domestic. While debate continues whether the Outer Space Treaty does, or does not, allow for nations to authorize commercial mining endeavors in space, it is apparent the desire exists and is a central interest in the renewed space race.<sup>48</sup>

### Why Space Mining

There is significant strategic and economic opportunity in the mining and exploitation of resources found in space, with specific interest in mining asteroids orbiting the earth. During a congressional space subcommittee review of the ASTEROIDS act, Dr. Mark Sykes, CEO and Director, Planetary Science Institute, stated:

Sustainable, long-term human activity beyond low-Earth orbit is not possible without the identification and cost-effective exploitation of resources, primarily water, from near earth objects. Commercial exploitation requires a reasonable period of time between investment and return on that investment. The development of an NEO ISRU infrastructure is beyond the scope of private

enterprise. No such infrastructure can be developed until we embrace a long-term vision requiring these resources and engage in a program to identify their sources, process them, develop the means to use them, and demonstrate that it can be done more cheaply than bringing everything up from the surface of the Earth.<sup>49</sup>

Dr. Sykes analysis on the plausibility of future space exploration is vital to U.S. national interests regarding current geo-political imbalances and the future of space travel. Resources that can be mined in space can be broken down into three classes: volatiles and water, platinum group metals, and structural metals.<sup>50</sup> The mining and development of resources in space has tremendous future applications that are driving several commercial companies throughout the world to develop technologies for space based resource extraction. Not only would the rise of platinum based metals increase technological advancements on earth, extraction of water and base materials in space would significantly reduce costs and waste in transporting raw materials into space. In essence, the mining of resources in space has the potential to do three things:

1. Unlock the next steps in space exploration and travel by making it more cost effective.<sup>51</sup>

2. Impact geopolitical imbalances. Mining resources on asteroids or the moon would shift current monopolies on items such as rare earth metals.<sup>52</sup> Currently, there is a space race between Russia, India, China, and the U.S. to gain access to the moon's Helium 3 (He3), an extremely rare commodity believed to be ideal for fusion reactors.<sup>53</sup> Whomever accesses this commodity first would have great advantage over other nations.

3. The development of needed technologies to explore, collect, and exploit said resources are just as valuable as the resources themselves. These technologies are growing at a rapid rate, much like the technologies in the 1960s that made it possible to collect resources from deep seabeds. With these developments countries are now looking

with more interest in the possibilities of mining celestial bodies within space. Currently, the U.S., Russia, India, and China are pursuing programs to begin exploitation of resources within the next five to fifteen years on the moon, as well as asteroids.<sup>54</sup>

### Proposed Laws

Due to the advancement in technologies, and the economic interests of several commercial companies, the U.S. Congress introduced the ASTEROIDS Act in August 2014.<sup>55</sup> This bill, if passed, will provide the necessary legal coverage for private industries in order to collect resources from celestial bodies, namely asteroids, by authorizing legal activities outside of U.S. jurisdiction.<sup>56</sup>

However, the introduction of the ASTEROIDS act has brought up several points of debate amongst the national, and international, communities regarding interpretations of current space law. The outer space treaty specifically authorizes that governments regulate space exploration for the benefit of all countries. The two trains of thought regarding this control granted to the U.S. are:

1. The U.S. has the authority to regulate space exploration and exploitation, to include commercial entities.
2. The Outer Space Treaty does not specifically state commercial exploitation of resources, thus it precludes it.

These debates have been going on for years, and only with the introduction of technologies forcing a policy decision is movement forward made. Research on this topic will take the similarities and differences between the Law of the Sea, and how the United States has implemented its policies, with that of the Space Law.

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<sup>1</sup> M. J. Peterson, “The Use of Analogies in Developing Outer Space Law,” *International Organization* 51, no. 2 (1997): 246.

<sup>2</sup> *Ibid.*

<sup>3</sup> Gabrynowicz, “One-Half Century and Counting,” 405.

<sup>4</sup> National Aeronautics and Space Act of 1958.

<sup>5</sup> Gilson, 1374.

<sup>6</sup> Central Intelligence Agency, “Field Listing: Legal System,” Fact Book, accessed February 18, 2015, <https://www.cia.gov/library/publications/the-world-factbook/fields/2100.html>.

<sup>7</sup> The Robbins Collection, “The Common Law and Civil Law Traditions” (School of Law, University of California at Berkeley, 2010), 5.

<sup>8</sup> Central Intelligence Agency, “Field Listing: Legal System.”

<sup>9</sup> The Robbins Collection, 5.

<sup>10</sup> Gilson, 1374.

<sup>11</sup> *Ibid.*

<sup>12</sup> Peterson, 251.

<sup>13</sup> *Ibid.*

<sup>14</sup> *Ibid.*, 252.

<sup>15</sup> *Ibid.*, 253.

<sup>16</sup> *Ibid.*

<sup>17</sup> *Ibid.*, 252.

<sup>18</sup> *Ibid.*

<sup>19</sup> *Ibid.*

<sup>20</sup> United National, General Assembly Resolution 1721, 16th Sess., Supplement 17 (1961).

<sup>21</sup> *Ibid.*

<sup>22</sup> Ibid.

<sup>23</sup> U.S. President, Executive Order 9633, *Policy of the United States With Respect to the Natural Resources of the Subsoil and Sea Bed of the Continental Shelf* (Washington, DC: White House, September 1945).

<sup>24</sup> United Nations News Center, “Overview-Convention and Related Agreements,” accessed February 18, 2015, [http://www.un.org/depts/los/convention\\_agreements/convention\\_historical\\_perspective.htm#Historical Perspective](http://www.un.org/depts/los/convention_agreements/convention_historical_perspective.htm#Historical%20Perspective).

<sup>25</sup> Ibid.

<sup>26</sup> Peterson, 254.

<sup>27</sup> U.S. President, *Treaty. Antarctic Treaty*, 86th cong., 2nd sess. (February 15, 1960.).

<sup>28</sup> Gilson, 1374.

<sup>29</sup> Ibid.

<sup>30</sup> Peterson, 261.

<sup>31</sup> National Aeronautics and Space Act of 1958.

<sup>32</sup> Gabrynowicz, “One-Half Century and Counting,” 412.

<sup>33</sup> United Nations Office for Outer Space Affairs, “United Nations Committee on the Peaceful Uses of Outer Space: Overview,” accessed January 22, 2015, [http://www.unoosa.org/oosa/en/COPUOS/cop\\_overview.html](http://www.unoosa.org/oosa/en/COPUOS/cop_overview.html).

<sup>34</sup> United Nations, *Treaty on the Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies*, 18 U.S.T. 2410, 610 U.N.T.S. January 27, 1967.

<sup>35</sup> Outer Space Treaty: Article 1.

<sup>36</sup> Ibid., Articles 2 and 4.

<sup>37</sup> Ibid., Articles 3 and 4.

<sup>38</sup> Ibid., Article 4.

<sup>39</sup> Ibid., Article 1.

<sup>40</sup> Ibid., Article 7

<sup>41</sup> Ibid., Articles 9 and 12.

<sup>42</sup> United Nations, General Assembly Resolution 2345, *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space*, April 22, 1968.

<sup>43</sup> United Nations, General Assembly Resolution 2777, *Convention on International Liability for Damage Caused by Space Objects*, March 29, 1972.

<sup>44</sup> United Nations, General Assembly Resolution 3235, *Convention on Registration of Objects Launched into Outer Space*, January 14, 1975.

<sup>45</sup> United Nations, General Assembly Resolution 3468, *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, December 18, 1979.

<sup>46</sup> Outer Space Treaty, Article 1

<sup>47</sup> United Nations, “Moon Agreement Participants,” accessed February 8, 2015, [https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg\\_no=XXIV-2&chapter=24&lang=en](https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXIV-2&chapter=24&lang=en).

<sup>48</sup> Edythe Weeks, *Outer Space Development, International Relations and Space Law a Method for Elucidating Seeds* (Newcastle upon Tyne, UK: Cambridge Scholars Publishing, 2012), 27.

<sup>49</sup> House, *Statement of Mark V. Sykes, CEO and Director Planetary Science Institute Before the Subcommittee on Space*, September 10, 2014.

<sup>50</sup> Christopher A. Lewick, “Planetary Resources’ Letter to Members of Congress Regarding H.R. 5063 – the ASTEROIDS Act,” September 10, 2014.

<sup>51</sup> Lewick, “Planetary Resources”; Shane D Ross, *Near-Earth Asteroid Mining, Space Industry Report*, December 14, 2001.

<sup>52</sup> Jim Kennedy, “China’s Rare Earth Monopoly and its formidable impact on U.S. National Defense,” Investor Intel, accessed May 12, 2012, <http://investorintel.com/technology-metals-intel/chinas-rare-earth-monopoly-formidable-impact-u-s-national-defense/#sthash.vFzxozsq.dpuf>.

<sup>53</sup> Mark Williams, “Mining the Moon,” MIT Technology Review, accessed May 12, 2015, <http://www.technologyreview.com/news/408558/mining-the-moon/>.

<sup>54</sup> Gilson, 1374.

<sup>55</sup> *Hearing before the Congressional Space Subcommittee*, H.R. 5063.

<sup>56</sup> Benjamin Pearlman. “Grounding U.S. Commercial Space Regulation in the Constitution,” *The Georgetown Law Journal* 100:929 (2012): 949.

## CHAPTER 3

### RESEARCH METHODOLOGY

#### Preliminary Steps in Research Design

Research in the last several decades has expanded to include a variety of choices in how to frame, or design, one's research methodologies. This chapter will layout intended framework to be adopted for research in order to guide the study to best answer the primary, and secondary, research questions.<sup>1</sup>

According to John W. Creswell, there are three preliminary steps in designing a research proposal, assess the claims brought to the study, and how to identify strategic inquiry to be used with specific methods.<sup>2</sup>

1. What knowledge claims are being made by the researcher (including a theoretical perspective)?
2. What Strategies of inquiry will inform the procedures?
3. What methods of data collection and analysis will be used?

Chapter 3 will focus on the development and explanation of these three categories in order to establish an effective methodology that fits the problem statement.

#### Knowledge Claims

Researchers make claims about what is knowledge (ontology), how we know it (epistemology), what values go into it (axiology), how we write about it (rhetoric), and the processes for studying it (methodology).<sup>3</sup>

Creswell explains that researchers begin a project with assumptions concerning how, and what, they will learn during the course of their inquiry.<sup>4</sup> These are called knowledge claims, or paradigms, and can greatly influence the entire methodology of a

research project. Paradigms are further defined by E.G. Guba as ‘a basic set of beliefs that guide action.’<sup>5</sup> According to Creswell, four schools of thought regarding beliefs on the topic being researched are often used when approaching a research problem. These four schools of thought, and their definitions, are as follows:

1. Post Positivism: Also known as the scientific method, this knowledge claim is best utilized in a quantitative study, which will be reviewed later in this chapter. Problems studied by post positivism ‘reflect a need to examine causes that influence outcomes, such as issues examined in experiments.’<sup>6</sup> Problems are measured with careful observation with set hypothesis.<sup>7</sup>

2. Constructivism: Also known as socially constructed knowledge claims, are identified assumptions of individuals, or specific groups, who seek understanding of experiences directed toward objects or things. Questions posed are broad in nature in order for participants to be able to construct the meaning of the situation studied.<sup>8</sup> This is due to the variety of meanings that can be placed on any given topic of research through the eyes and understanding of the individuals being questioned.

3. Advocacy Participatory: This is a relatively new knowledge claim that takes the stance that constructivism is too broad and needs a focused political agenda that is designed to enact change.<sup>9</sup> This targets social issues the researcher believes needs to be changed, and takes the perspective of a specific side.

4. Pragmatism: There are a variety of forms of the pragmatic approach to knowledge claims. At its core, the pragmatic paradigm’s focus is the problem being the most important aspect versus the method. This is primarily due to a knowledge claim resulting from actions, situations, and consequences rather than existing logical

conditions that will infer solutions.<sup>10</sup> Due to the nature of the pragmatic knowledge claim, Creswell suggests pragmatism as a basis for the mixed methods approach.<sup>11</sup>

Of the four paradigms described by Creswell, pragmatism was the paradigm used throughout this study, which aided in the selection of research methodology data collection.

### Strategy

Strategies with research provide direction in research design.<sup>12</sup> While multiple strategies exist there are several to be considered when approaching the problem statement of this paper.

Creswell further defines five separate strategies in examining research. These include narrative research, phenomenology, grounded theory, ethnography, and case studies. The first four of these methodologies involve the study of a people or culture, and are not applicable to this study.<sup>13</sup> The fifth strategy recommended by Creswell is defined as the Case Study.

Case studies are a strategy used by researchers to explore events, activities, processes, laws, and programs in depth. Additionally, a case study can include multiple cases and events. For the purpose of this paper the case study strategy will assist in designing an appropriate method to compare interpretations of existing and proposed space laws that either have similar terminology (the ASTEROIDS act), or were instrumental in the development of existing space law (Law of the Sea and the Antarctic Treaty).<sup>14</sup> However, the typical case study strategy only compares two cases. This creates a problem in the strategy as multiple laws and situations exist, and which must be

explored, to answer the primary and secondary research questions. However this is solved by using an intrinsic case study.

An intrinsic case study focuses on the case, program, or source of study itself and can use multiple comparisons to add, or take away, from the study in question.<sup>15</sup> This strategy will allow the use of all existing laws with common access terminology to be used within the study.

This proposed method will provide specific research focus within the problem statement, as well as the primary and secondary research questions, while allowing flexibility in collecting information from historical data, theories, issues and solutions, and a survey of multiple subject matter experts regarding the research questions. This then leads into which method is best used for this type of comparative study.

#### Qualitative, Quantitative, or Mixed Methods Approach

In order to effectively answer the above stated thesis within a case study strategy a methodology of research must be selected. Possible choices in methods used include quantitative, qualitative, or mixed methods. The following are definitions of each method.

Quantitative research, also known as the scientific method, has been around for centuries. This method includes a means for testing objective theories by measuring relationships among variables, which in turn produces data that can be measured via instruments, tables, or other tools to measure information in order to produce statistical information to be analyzed.<sup>16</sup>

Qualitative research is defined as a means for investigating and understanding meaning ascribed to a social, or human problem. According to Creswell, qualitative

research is the process that “involves emerging questions and procedures, data typically collected in the participant’s setting, data analysis inductively building from particulars to general themes, and the researcher making interpretations of the meaning of the data.”<sup>17</sup>

With a qualitative research approach theories can be, and often are, developed throughout the entire process, whereas a quantitative approach must begin with a specific hypothesis in mind.

The mixed method approach, which is a developing research approach, combines elements of both qualitative and quantitative forms. According to Creswell it “involves philosophical assumptions, the use of qualitative and quantitative approaches, and the mixing of both approaches in a study. Thus, it is more than simply collecting and analyzing both kinds of data; it also involves the use of both approaches in tandem so that the overall strength of a study is greater than either qualitative or quantitative research.”<sup>18</sup>

### Design

Due to the nature of the primary and secondary research questions, specifically in comparing varied existing laws with similar terminologies, it was determined to use a mixed methods research approach due to the utilization of a survey combined with exploratory research of written articles addressing the issues of current policies regarding common access areas.<sup>19</sup>

### Data Collection Methods

The proposed research will be a qualitative study using the intrinsic case study theory. The problem statement revolves around one specific policy issue, which is the allowance of commercial entities within the United States to mine resources on celestial

bodies, specifically that of the moon and asteroids. Comparisons with the Law of the Sea and Antarctic Treaty will be researched to determine if precedence is, or is not, established for the United States to authorize commercial entities to mine in common access areas. Once determined if precedence does, or does not, exist further comparisons can be made as to the necessity of the currently proposed ASTEROIDS act and possible international responses.

Research will be done using four different sources of information. The first source will be utilizing existing and proposed international treaties regarding commercial rights in common access areas. Simple comparisons will be used between terminologies found in U.S. laws, specifically international treaties the U.S. is party to, regarding areas of common access.

The second source of information will be what current U.S. administrative authorities and law makers have stated regarding rights to mine commercially in common access areas. This includes promises made to commercial entities and the ASTEROIDS act.

The third source of information to compare will be published research regarding U.S. licensing of commercial entities to mine in common access areas. This will capture dialogue on what is, and is not, debated within the community on established precedents. This portion of research will compare commercial rights to mine celestial bodies in space with the Antarctic treaty and Law of the Sea.

Lastly, in order to understand the overall professional communities thought processes on established precedence's of commercial activities in common access areas a survey will need to be developed. This survey will target a focused group of subject

matter experts of space law, to include nationally acclaimed professionals who have either published works on space laws, or who have testified in congress or the senate regarding international space policies. Other person's to be surveyed will include businesses currently developing technologies with the purpose of resource collection in space. Lastly, representatives in congress will be sent a survey to bring current political interests into this study.

The development of a survey to answer the primary and secondary research questions is necessary in order to ascertain meaningful data for further analysis. The reason to use a survey as the primary vehicle for this research is that a survey has the potential to garner focused information in a short amount of time from subject matter experts.<sup>20</sup> Additionally, a survey will allow for comparison of current collected data with the answers from subject matter experts in the fields of space law.

This survey will cover the following three general topics in order to best answer the primary and secondary research questions.

1. Clarification of the U.S. definition of 'Common Heritage of Mankind' and common access areas. This will determine if there is an established U.S. definition on the use of such terminology and if this supports commercial mining in areas outside of jurisdictional authority.

2. U.S. actions and position regarding UNCLOS, Space Treaties, and the Antarctic Treaty with regard to authority to license commercial entities to mine in areas of common access. This will determine if precedence has already been established in other areas within the global commons that would indicate the U.S. authority to license commercial entities to mine in space.

3. Possible international responses if the U.S. proceeds with licensing commercial entities to mine in space. Comparisons between U.S. actions in other common access areas regarding commercial mining and international responses to these actions, will provide an understanding of possible outcomes if the U.S. were to authorize commercial mining operations in space.

The vast majority of data to be collected includes federal and international space and sea laws, articles and arguments of space law from renowned space legal advisors, proposed US legislation of private sector space mining and subsequent testimonies to congress. Additionally, a survey will need to be written and distributed to U.S. legal space experts throughout the career field to garner varying points of view on whether the Law of the Sea and Antarctic Treaties are valid precedents on how the United States policies in mining operations on celestial bodies would be perceived.

#### Data Analysis Methods

Due to the nature of many interpretations of existing space laws, and theories regarding the proposed ASTEROIDS act, there are simply too many inferences that could be drawn by researching solitary case studies. In these instances, Creswell recommends the categorical aggregation method of data analysis.<sup>21</sup> This includes taking collected data and comparing said data in order to ascertain the common themes.

While this is easily stated, the nature of collecting data and finding developing a thematic approach from research is difficult at best. In order to simplify and categorize the information researched data will be separated into five distinct categories. These categories have been established in order to answer the primary and secondary research questions.

1. Survey Demographics; The demographics of those surveyed are essential to validate if individuals surveyed have the proper knowledge base and expertise to participate in such a focused survey.

2. Common heritage of mankind, similar principles and what has been adopted by the U.S: This section will identify the differences between the various principles, terminologies, and definitions that encompass the common heritage principle and areas of common access. While it does not answer the primary research question, it will lay the foundation in understanding U.S. interpretation of the above stated principles, which is a vital step to answering the primary research question.

3. U.S. Actions Establishing, or Denying, Precedence for the Allowance of Space Mining: This section will answer the primary research question and goes into great depth on U.S. actions within areas of common access in accordance with international,, and national, space policies. Additional information derived from this research will validate if foundational treaties used as analogies in creating the Outer Space Treaty are still viable today.

4. The ASTEROIDS Act: The introduction of the ASTEROIDS act in July 2014, and its subsequent review in September 2014, is key to understanding current U.S. policy regarding commercial mining operations in space. This section will look at the purpose of the ASTEROIDS act, possible ramifications, and what the introduction of such a bill means within the international space community.

5. Possible International Response to U.S. Pursuance of Legalizing Commercial Space Mining: Understanding possible international ramifications play a role within international politics. This section explores what possible responses may take place if the

U.S. legalizes the issuance of licenses to the commercial sector with the intent to mine, and retain, resources in space.

Due to the a multitude of interpretations within four of the five sections listed above, minus survey demographics, each category will then be further broken down into what is fact and what is theory.

### Fact

Defined as an Incident, act, event, or circumstance. Something that has already been done or an action in process. It is an event that has definitely and actually taken place, and is distinguishable from a suspicion, innuendo, or supposition. A fact is a truth as opposed to fiction or mistake.<sup>22</sup> For the purpose of analysis facts will be categorized in the following manner:

1. Explicit authorities within international treaties that cannot be argued.
2. U.S. actions that set precedence, or provide insight, within areas of common access.
3. Established U.S. definitions regarding commercial endeavors in space.
4. Administrative, and legislative, statements regarding international policy and commercial rights in common access areas.

### Theory

Defined as an explanation or proposal whose status is still conjectural and subject to experimentation, in contrast to well-established facts.<sup>23</sup> This category will include interpretations, assumptions, and opinions that cannot be proven to be currently in force within U.S. policies.

International laws are often vague, leaving room for flexible interpretation by many parties. Nations seldom define what is not stated, leaving room for possible future applications while maintaining diplomatic ties. This opens the door to several theories that may, or may not, be recognized by the U.S. or other nations.

By separating the data into two separate categories the researcher will be able to identify what is said within each treaty, what is agreed upon by the international community regarding commercial mining in common access areas, and what is being interpreted as theory by states and subject matter experts. By identifying theories early on in research it will set aside conjecture while identifying central issues of concern in moving forward with the ASTEROIDS act. Additionally, it will establish existing precedence that either supports or denies assumptions within the ASTEROIDS act regarding the US authority to regulate space mining.

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<sup>1</sup> John W. Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 2nd ed.(Los Angeles: Sage Publications), 3.

<sup>2</sup> Ibid., 5-6.

<sup>3</sup> Ibid., 6.

<sup>4</sup> Ibid.

<sup>5</sup> Egon G. Guba, *The Paradigm Dialog* (Newbury Park, CA: Sage Publications, 1990), 17.

<sup>6</sup> Creswell, *Research Design*, 7.

<sup>7</sup> Ibid., 6-7.

<sup>8</sup> Ibid., 8-9.

<sup>9</sup> Ibid., 11-12.

<sup>10</sup> Ibid., 13.

<sup>11</sup> Ibid.

<sup>12</sup> Ibid., 14.

<sup>13</sup> John W. Creswell, *Qualitative Inquiry and Research Design: Choosing among Five Approaches*, 2nd ed. (Thousand Oaks: Sage Publications, 2007), 53-80.

<sup>14</sup> Ibid., 74.

<sup>15</sup> Ibid.

<sup>16</sup> Creswell, *Research Design*, 4.

<sup>17</sup> Ibid.

<sup>18</sup> Ibid.

<sup>19</sup> Ibid.

<sup>20</sup> Lois A Ritter and Valerie M. Sue, "Using Online Surveys in Evaluation," Edited by Sandra Mathison (*New Directions for Evaluations*, No 115, 2007), 7.

<sup>21</sup> Creswell, *Qualitative Inquiry and Research Design*, 163.

<sup>22</sup> TheFreeDictionary.com, "Fact," accessed May 7, 2015, <http://legal-dictionary.thefreedictionary.com/fact>.

<sup>23</sup> Dictionary.com, "Theory," accessed May 7, 2015, <http://dictionary.reference.com/browse/theory>.

## CHAPTER 4

### ANALYSIS REGARDING U.S. PRECEDENCE OF COMMERCIAL ACTIVITIES WITHIN AREAS OF COMMON ACCESS

To reiterate, the primary research question is: The purpose of this comparative study is to identify the similarities and differences between current and proposed Space Laws with other international treaties that conceptualize ‘The Common Heritage of all Mankind,’ specifically UNCLOS and the Antarctic Treaties. Emphasis will focus on if the United States has established precedence in historical endorsement of commercial resource acquisition in areas designated outside of international jurisdiction. Secondary research questions that support the primary are as follows:

1. Is there a difference between the definition of Areas of Common Access and the Common Heritage of Mankind?
2. Does precedence exist for U.S. to license commercial entities for commercial mining in open access areas?
3. Both the Antarctic Treaty of 1959, and the foundations of UNCLOS, were used as analogies in the development of the Outer Space Treaty of 1967. Do these common access treaties still remain viable comparisons today regarding space law?
4. Would the currently proposed ASTEROIDS act (if passed into law) indicate the U.S. interpretation of the Outer Space Treaty, specifically that the U.S. retains the right to license commercial entities to mine in space?
5. Would there be a negative response from the international community of the U.S. were to issue commercial mining licenses without further refinement of current space policies?

Chapter 2 reviewed the history and development of space law through the use of analogies, specifically UNCLOS and the Antarctic Treaty. Additionally, chapter two reviewed the challenges in developing international policies that are acceptable to countries with varying law requirements, namely common vs civil law, and separate international objectives. The U.S. utilizes common law, a system based on precedents and analogies, which ties into the foundation of the research question and if the U.S. has already established precedence in similar common access areas that could be used to justify commercial space mining.

Chapter 3 identified the primary methodology being mixed methods, by utilizing a survey that targets subject matter experts with the intent to refine information gathered throughout the research. Results from systematic research and the survey are included in this chapter, with conclusions following in chapter 5. Analysis will be broken into five categories as indicated in the Data Analysis Methods in chapter 3.

1. Survey Demographics.
2. Common heritage of mankind, similar principles, and what has been adopted by the U.S.
3. U.S. actions establishing, or denying, precedence for the allowance of space mining.
4. The ASTEROIDS Act.
5. International response to U.S. pursuance of legalizing commercial space mining.

Each category answers one or more of the primary and secondary research questions, and are reflected accordingly. Each question within the above stated categories

will be broken down into what is fact and what has been posed as theory, as there is much debate throughout the space community regarding commercial rights to mine in space.

### Presentation of Analysis: Survey Demographics

A total of 24 individuals were identified as being subject matter experts in space policy both internationally and nationally. In order to gain the broadest perspective a wide range of representation was selected between law makers, commercial entities with interests in space mining, lawyers specializing in space law, and academic professionals who have contributed to space policy. Of those surveyed 33 percent participated in the survey, with 21 percent finishing the survey to the end. A breakdown of respondents is shown in figure 2.

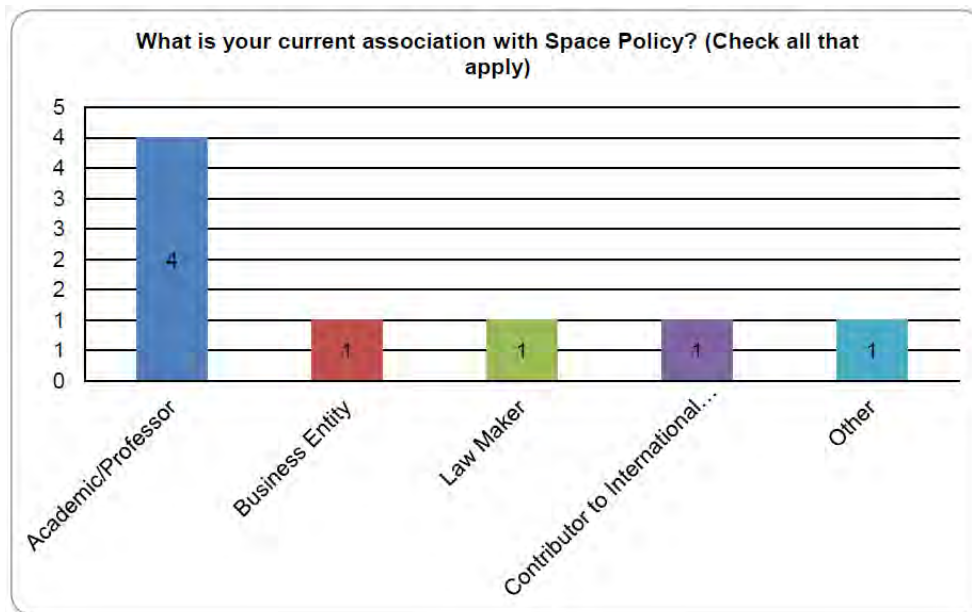


Figure 2. Survey Demographics

Source: CGSC Survey 15-03-034, April 14, 2015.

Respondents were asked to rate their understanding of UN Space Treaties, US Space Laws, UNCLOS, and the Antarctic Treaty. Most respondents have moderate to expert level knowledge in each category, with the exception of only some knowledge by one individual in both UNCLOS and Antarctic Treaty. (See figure 3)

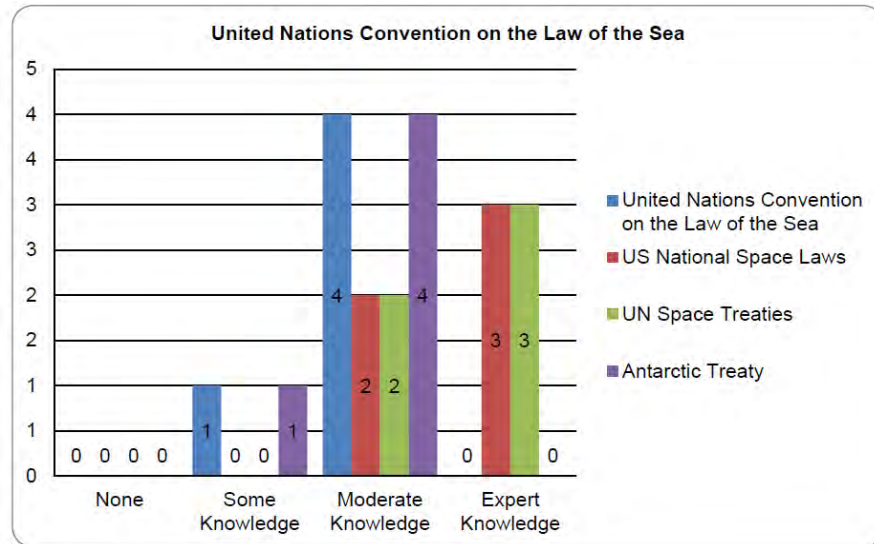


Figure 3. Knowledge Base of Common Access Areas

Source: CGSC Survey 15-03-034, April 14, 2015.

Common Heritage of Mankind, Similar Principles,  
and What Has Been Adopted by the U.S.

Secondary Research Question 1

Is there a difference between the definition of Areas of Common Access and the Common Heritage of Mankind?

## Facts

There is a distinct difference between the terminology common access areas and the common heritage principle. According to Prof. Doyle, common access areas are open to use by all equally, including the high seas and space. This concept refers to areas that fall outside of any jurisdictional authority, and remain a global commons.

This brings us to the definition of the common heritage principle. The definition and evolution of the common heritage principle has been debated in various forms since its inception in 1954 during the Hague Convention for the Protection of Cultural Property in the Event of Armed Conflict.<sup>1</sup> Since then the U.S. has been a strong advocate for the principle in its various forms. An example being the U.S. push for the analogy of the high seas to be used to justify space being a common access area and for the free use for all in the early 1960's. This analogy was key in developing the Outer Space treaty, which also has ties to the common heritage principle. Yet, to date, the U.S. has continued to flex the common heritage principle so that it meets the objectives of the U.S. strategic outlook.

The international definition is defined in both the UNCLOS agreement of 1972 and Moon Agreement of 1979.

The General Assembly of the United Nations solemnly declared inter alia that the area of the seabed and ocean floor and the subsoil thereof, beyond the limits of national jurisdiction, as well as its resources, are the common heritage of mankind, the exploration and exploitation of which shall be carried out for the benefit of mankind as a whole, irrespective of the geographical location of States.<sup>2</sup>

The moon and its natural resources are the common heritage of mankind, which finds its expression in the provisions of this Agreement.<sup>3</sup>

The definitions established by these two treaties indicate that the common heritage principle provides indivisible access, and rights of ownership, by all nations and people. Furthermore, both treaties detail that exploitation of common heritage resources must be shared with all on an equitable basis. In the case of UNCLOS this resulted in the creation of the International Seabed Authority, an international entity established to oversee disputes and distribute taxes and fees from countries who have gathered resources from the seabed outside of jurisdictional boundaries to other signatories of the convention. The Moon Agreement tried to template the precedence set by UNCLOS, with the creation of an international authority, but ultimately failed to do so.

It is imperative to note the U.S. is not party to either the Moon Treaty or UNCLOS, which has been interpreted by a variety of sources the U.S. does not acknowledge the current international definition of the common heritage principle.

### Theory

The argument could be made that most of the world has ratified UNCLOS (See figure 4) representing 157 countries. The U.S. is a signatory on the 1994 UNCLOS agreement. This supports the argument that a definition has already been established regarding the common heritage principle, and the U.S. has agreed to this definition when they signed the convention in 1994.



Figure 4. Nations Party to UNCLOS

*Source:* Justin Ordoyo, “The 1982 United Nations Convention on the Law of the Sea,” Slide 6, accessed March 13, 2015, <http://www.slideshare.net/justinordoyo/united-nations-convention-on-the-law-of-the-sea-unclos>.

The counter argument is the U.S. senate has not ratified the UNCLOS agreement into law. The U.S. abides by most other articles within the agreement, except the common heritage definition and the resulting international authority placed over countries that have ratified the agreement. Furthermore, the moon agreement was a failure amongst the international community, namely due to the restrictions implied by the similar use of the common heritage definition. By the overwhelming rejection of the moon agreement an argument could be made the definition is not accepted internationally. (See figure 5)

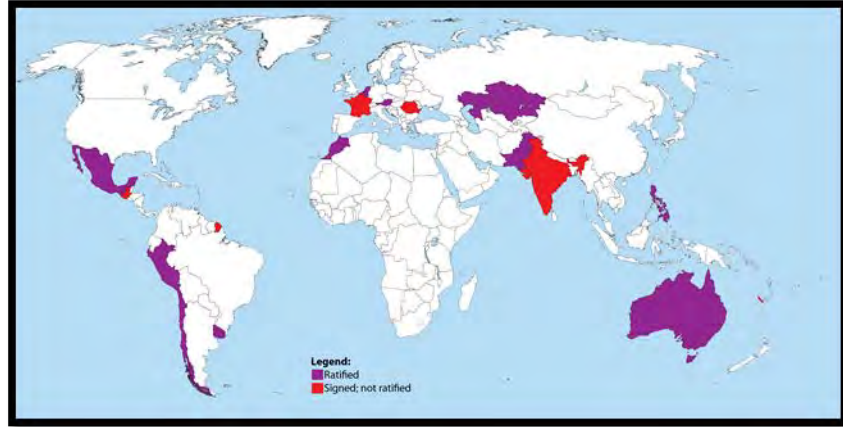


Figure 5. Nations Party to the Moon

*Source:* Born for Space, “The Moon Agreement,” accessed March 13, 2015, <https://born4space.wordpress.com/2013/12/17/the-moon-agreement/>.

Other definitions have been posed to the U.S. regarding the Common Heritage principle, such as Professor Stephen Doyle’s definition of ‘equitable’ within UNCLOS and the Moon Treaty. His definition of equitable is that nations who contribute in manpower, resources, or other means would be compensated accordingly. Those nations that do not contribute to an endeavor would not receive compensation. By using this definition it would allow the U.S. to join the UNCLOS agreement while maintaining current interests within common access areas. This would also support future commercial mining efforts in space. However, current international law does not differentiate between contributing, and non-contributing, nations.<sup>4</sup>

One additional theory being pushed by renowned Professor (Emeritus) Joanne I. Gabrynowicz, is for the U.S. to separate from the common heritage principle altogether. Prof. Gabrynowicz suggests that the common heritage principle has already been defined by the international community, which the U.S. does not recognize. However, the U.S. is

a signatory to the Outer Space Treaty of 1967, which has common, but distinctly different, language. Specifically, the Province of Mankind. By doing so the U.S. would have a clear definition of the common heritage principle, while not having to adhere to the international definition. As most countries are party to the Outer Space Treaty the U.S. would be able to argue their definition for space under the province of mankind principle vs the common heritage principle. As of yet the U.S. has not adopted this stance.<sup>5</sup>

U.S. Actions Establishing, or Denying, Precedence  
for the Allowance of Space Mining

Secondary Research Question 2

Does precedence exist for U.S. to license commercial entities for commercial mining in open access areas?

Facts

Open access areas are specifically areas that do not fall under any nation's jurisdictional authority. These include space, the high seas, and Antarctica. This topic is a highly debated field of study within the professional circles throughout the world. Even within those surveyed there was a divided response (see figure 6). Analysis regarding each area, with supporting documentation of U.S. actions and comparisons, follow.

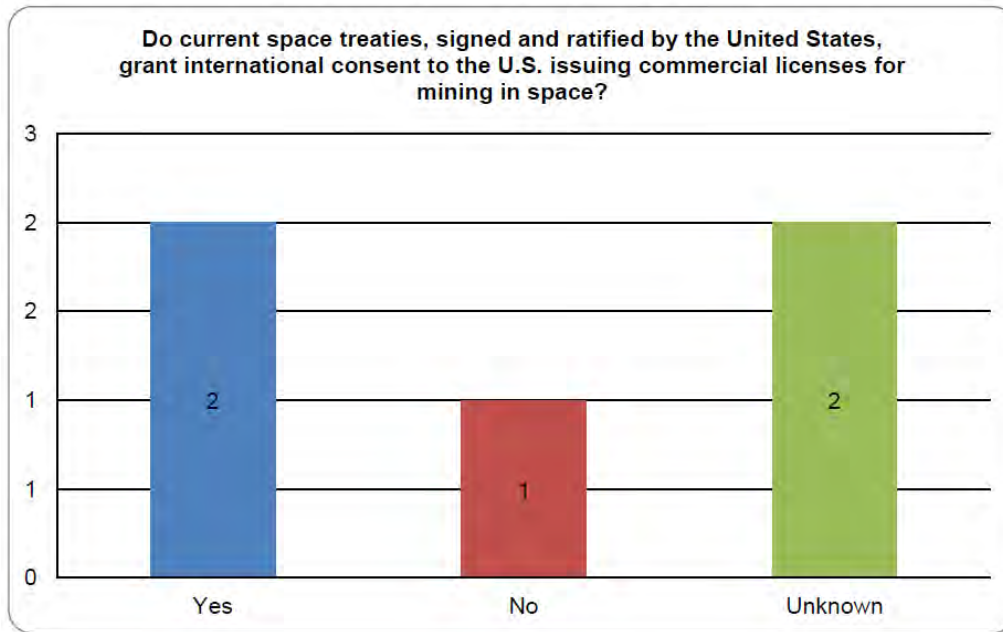


Figure 6. Disparity Amongst Subject Matter Experts

Source: CGSC Survey 15-03-034, April 14, 2015 (Appendix B). Note: Figure 6 indicates disparity of subject matter experts from survey regarding U.S. authority to grant commercial licenses.

### The High Seas

U.S. actions within the high seas are not in harmony with most of the international community as the U.S. has not ratified UNCLOS IV. Instead, the U.S. adheres to the 1945 executive order 9633, "Policy of the United States with Respect to the Natural Resources of the Subsoil and Sea Bed of the Continental Shelf."<sup>6</sup> This proclamation confirms two points within my research.

1. We cannot use the common heritage principle as this terminology does not appear anywhere within the proclamation in any form. Without the use of specific

terminology that can prove U.S. intent, precedent cannot be established regarding U.S. policies and the high seas.

2. The proclamation claims the entire U.S. continental shelf as belonging to the U.S., implying all resources in the subsoil as property belonging to the U.S. All U.S. commercial mining activities on the continental shelf are legal within U.S. courts as the shelf is recognized as property of the U.S.

Debate between administration staffs and the U.S. Senate have been ongoing since 1994 regarding the ratification of UNCLOS IV into law. The most recent being a hearing between Secretaries of both State and Defense with the Senate in 2012, where discussion on benefits and costs of ratifying UNCLOS IV centered around authority to enforce the treaty world wide and monetary cost to the U.S.<sup>7</sup>

## Antarctica

The Antarctic treaty of 1959 does include terminology referencing the common heritage principle, but does not specifically define the meaning of the principle. What the treaty does state is Antarctica is to be used for peaceful scientific purposes only, no commercial resource acquisition is currently allowed.<sup>8</sup> As the U.S. signed and ratified this treaty in 1959 and 1960 respectively, with the treaty coming into force in 1961, the agreement was made into law. The U.S. has never issued commercial licenses to mine resources, for profit or gain, within Antarctica. Furthermore, all activities within Antarctica are for scientific purposes only, and do not provide a legal precedence for mining commercially in space. The treaty does allow for future amendments, but no amendments have been made to allow for exploitation of resources outside of scientific intent.

## Space

With the exception of the Moon Agreement, which is considered a failure, no other international treaty regarding space specifically authorizes a nation to license commercial entities to mine resources. Article VI of the Outer Space Treaty does state, “the activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty.”<sup>9</sup> This statement remains ambiguous as to what boundaries, if any, are provided within nation states to authorize space related excursions and for what purposes. Debate between a variety of parties within the international, and domestic, space arenas continue to this day if article VI does, or does not, include a nation’s right to license and regulate commercial entities. To date, no commercial entity throughout the world has mined any resources in space, thus setting no legal precedence. Nations have only authorized government sanctioned scientific exhibitions. Additionally, the U.S. has not stated they have the right to license commercial entities for space mining. What is authorized remains ambiguous.

Two recent instances have given the U.S. opportunity to provide insight on their interpretation of the Outer Space Treaty. The first was the introduction of the ASTEROIDS act, as written in chapter 2 of this paper. The passing of the ASTEROIDS act into law would clarify the U.S. stance on article VI of the Outer Space Treaty. However, this bill is still being reviewed within the U.S. congressional Science, Space, and Technology committee, and has not been pushed forward for vote within congress.

The other instance is where the Federal Aviation Authority (FAA), which grants commercial licenses for travel into space, stated in December 2014 they intend to

“leverage the FAA’s existing launch licensing authority to encourage private sector investments in space systems by ensuring that commercial activities can be conducted on a non-interference basis.”<sup>10</sup> In both instances U.S. government officials have remained ambiguous as to the exact definition and how this relates to commercial mining operations in space. However, the FAA’s statement does come close to stating its authority to do so.

### Theory

#### High Seas

Arguments could be made U.S. Executive Order 9633 grants authority to the U.S. to mine in areas of common access. However, 9633 does not indicate the U.S. has authority to mine in common access areas, but claims authority over the U.S. continental shelf.<sup>11</sup> The U.S. would have to pass legislation into law, or another executive order would need to be issued, to claim precedent, or authority, to grant commercial license outside of U.S. borders.

#### Space

Many theorists believe the Outer Space treaty of 1967, under article VI, does authorize nations to license commercial entities to conduct business in space. However, no evidence has been found indicating any nation setting a precedent in authorizing commercial mining operations in space. This topic continues to be debated throughout the professional field with different stances being taken. This was confirmed from the results of survey where the respondents were spread between yes, no, and unknown. (See

figure 6 above.) Even within the concentrated group of experts surveyed there is an evident disparity of what is believed to be true.

### Secondary Research Question 3

Both the Antarctic Treaty of 1959, and the foundations of UNCLOS, were used as analogies in the development of the Outer Space Treaty of 1967. Do these common access treaties still remain viable comparisons today regarding space law?

#### Fact

Both treaties were used as analogies in the creation of space law to classify outer space as a common access area.<sup>12</sup> The Antarctic Treaty was used as an analogy to extend the non-appropriation principle, demilitarization, and jurisdictional control of expeditions on celestial bodies. The high seas analogy was used to define flag state jurisdiction over any craft traveling through space. Both analogies were instrumental in the development of the Outer Space Treaty of 1967.<sup>13</sup>

Once the Outer Space Treaty was signed, uses of the Antarctic Treaty and UNCLOS as analogies for outer space have been limited to the Moon Treaty. The analogy being pushed with the Moon Treaty was for a similar definition of Common Heritage of Mankind as was defined in UNCLOS. This was the last official attempt to tie either the Antarctic Treaty, or UNCLOS, to policies and definitions regarding space. As indicated in figure 5, the Moon Treaty was a failure as most nations, to include the world powers, refused to be participants. While most of the world accepted the common heritage principle for the high seas, not including the U.S., no world superpower wanted the same restrictions this analogy would emplace on them if ratified into law.<sup>14</sup>

This does not mean the Antarctic Treaty, or UNCLOS, will not be used in future space policy development. As indicated by Dr. Gabrynowicz from her response to this question from the survey, it depends on what precedent might be argued in the future.<sup>15</sup>

### Theory

Most theories surrounding the use of the Antarctic Treaty and UNCLOS (specifically the common heritage principle) surround proposed legal strategies when nations begin extracting resources from space. These theories suggest nations who are party to the Moon Treaty will attempt legal action against nations who are actively collecting resources for monetary gain. Theory suggests the strategy of comparing the common heritage principle between UNCLOS and the Outer Space Treaty will be used in an attempt to force settlement.<sup>16</sup> However, no precedent has been set as nations have yet to actively collect resources for other than government sponsored scientific purposes.

### The ASTEROIDS Act

#### Secondary Research Question 4

How would the currently proposed ASTEROIDS act (if passed into law) indicate the U.S. interpretation of the Outer Space Treaty?

The ASTEROIDS act is currently being reviewed by the congressional space subcommittee. There are many gaps within the proposed bill that must be addressed before being pushed forward through congress. In order to answer the above stated question effectively, a slight change to the method used to present analysis will need to be made. Information below will be presented as to what the ASTEROIDS act would, and would not, accomplish.

What the ASTEROIDS act would accomplish, if passed into law in its current state, is the following:

1. The U.S. interpretation of the Outer Space Treaty regarding authority to oversee and license commercial resource mining in space would be clarified.<sup>17</sup>
2. The U.S. would recognize commercial entities rights in retaining possession of materials mined with a reasonable expectation of security, or as the proposed bill states “Freedom from Harmful Interference.”<sup>18</sup>
3. If the ASTEROIDS act were to be passed into law as is U.S. commercial industries could claim resource rich environments in space prior to the act of extraction.<sup>19</sup> This is in direct contrast to the Outer Space Treaty’s article’s II and IV, where outer space and celestial bodies are not subject to appropriation.

What the ASTEROIDS act does not accomplish is more complex, and is the primary reason why congress assigned the sub-committee on space in July 2014 to review the bill.<sup>20</sup> The following is what the ASTEROIDS Act does not do, and must be addressed prior to passing the law.

1. The current U.S. administration’s policy toward space is to develop International dialogue, or an agreed upon code of conduct, for space based activities.<sup>21</sup> The ASTEROIDS act does not address U.S. responsibilities to the international community.
2. Current administrative infrastructure within the federal system is not sufficient to provide necessary oversight and licensing for commercial mining in space. Professor Gabrynowicz testified before the congressional space subcommittee that the ASTEROIDS Act “will raise novel issues requiring a wide range of entrepreneurial,

technical, economic, legal, policy, space situational awareness, and diplomatic expertise. No one agency houses all that will be needed.”<sup>22</sup> Prior to being passed into law administrative oversight in multiple areas must be addressed. Currently, U.S. law regulates the launch and reentry of space vehicles, technology, payloads and technology for space based activities, intellectual property, and import/export control.<sup>23</sup>

As it currently stands, the ASTEROIDS act will need to be revised, or replaced, in order to address the concerns listed above. However, a major accomplishment is the introduction of the bill in the first place. Commercial mining in space is an eventuality, and this is the first bill pushed forward to address current gaps in legal and administrative infrastructure.<sup>24</sup>

### Possible International Response to U.S. Pursuance of Legalizing Commercial Space Mining

#### Secondary Research Question 5

Would there be a negative response from the international community of the U.S. were to issue commercial mining licenses without further refinement of current space policies?

#### Fact

Multiple sources indicate there would be an international response to any U.S. endeavor to pursue commercial exploitation of resources within space. This includes respondents to the survey (see figure 7), news sources, and space policy experts. However, research has uncovered nothing conclusive on what international responses might entail. No international statements have been made against the introduction of the ASTEROIDS act, only vague speculation. What is known is countries such as China and

Russia, both space faring nations, have made statements with the intent to extract resources on celestial bodies, to include the moon.<sup>25</sup> We also know that 15 nations have ratified the Moon Agreement, which indicates their stance on how future space exploitation should be shared amongst the masses.

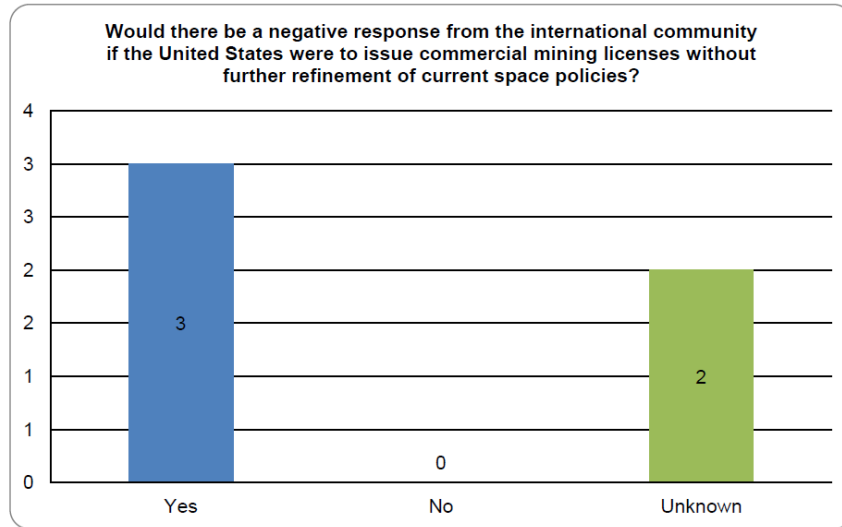


Figure 7. International Reponse

*Source:* CGSC Survey 15-03-034, April 14, 2015 (Appendix B). Note: Table indicating overall belief of surveyed professionals regarding a possible negative international response to the U.S. proceeding with space mining.

### Theory

Once space mining begins there will be an international outcry, specifically amongst nations who do not have space based capabilities. While this is theory, and is yet unproven, it is generally accepted this will be the case, specifically with the 15 nations who are party to the Moon Agreement. These nations do not currently have space capabilities, and would likely argue for the international definition of the common

heritage principle, namely that all resources collected in common access areas are to be shared accordingly. However, these nations can be ignored legally as the U.S. does not recognize their claim, nor does it recognize the Moon Agreement.<sup>26</sup> What will concern the U.S., as Prof. Doyle indicates in his survey response, is if “one of the major powers (i.e. the 5 UN Security Council veto powers) raised an objection.”<sup>27</sup> If such an instance does occur, bilateral meetings with the superpower questioning the action would likely take place. To date, no objections have been made by the 5 powers to any announcements made with the intent of commercial collection of resources in space.

### Summary

In summary, research made in this area indicates the following:

1. Is there a difference between the definition of Areas of Common Access and the Common Heritage of Mankind? Yes. There is no established U.S. definition when it comes to the common heritage principle as the U.S. is currently not party to UNCLOS or the Moon Agreement. However, areas of common access are clearly defined.

2. Does precedence exist for U.S. to license commercial entities for commercial mining in open access areas? No. The U.S. cannot claim precedence for commercial resource acquisition in space as there is no legally recognized action by U.S. commercial enterprises within areas of common access.

3. Both the Antarctic Treaty of 1959, and the foundations of UNCLOS, were used as analogies in the development of the Outer Space Treaty of 1967. Do these common access treaties still remain viable comparisons today regarding space law? Yes. The continued use of UNCLOS and the Antarctic Treaty as analogies for international space law is viable, but depends on which principle is to be argued.

4. Would the currently proposed ASTEROIDS act (if passed into law) indicate the U.S. interpretation of the Outer Space Treaty, specifically that the U.S. retains the right to license commercial entities to mine in space? Yes. However, the ASTEROIDS act needs revision in order to ensure it is in alignment with U.S. legal obligations to the Outer Space Treaty and current U.S. administrative policies.

5. Would there be a negative response from the international community of the U.S. were to issue commercial mining licenses without further refinement of current space policies? Yes. An international outcry if the U.S. unilaterally pursues commercial space mining is likely, but still remains an unknown. Primary concern for the U.S. is how the 5 UN Security Council veto powers would react.

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<sup>1</sup> United Nations. Convention for the Protection of Cultural Property in the Event of Armed Conflict. (May 14, 1954).Preamble.

<sup>2</sup> United Nations, *United Nations Convention of the Law of the Sea*, December 10, 1982.

<sup>3</sup> United Nations, General Assembly Resolution 34/68, *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, December 18, 1979, Article XI.

<sup>4</sup> CGSC Survey 15-03-034, April 14, 2015 (Appendix B), 33.

<sup>5</sup> Joanne I. Gabrynowicz, “The Province and Heritage of Mankind Reconsidered: A New Beginning,” *Second Conference on Lunar Bases and Space Activities 2*, no. 8 (1992): 691.

<sup>6</sup> Executive Order 9633.

<sup>7</sup> Senate, *The Law of the Sea Convention (Treaty Doc. 103-39): The U.S. National Security and Strategic Imperatives for Ratification*, May 12, 2012.

<sup>8</sup> U.S. President, *Antarctic Treaty*.

<sup>9</sup> Outer Space Treaty. Article 6.

<sup>10</sup> Irene Klotz, “The FAA: Regulating Business on the Moon,” *Reuters*, accessed April 21, 2015, <http://www.reuters.com/article/2015/02/03/us-usa-moon-business-idUSKBN0L715F20150203>.

<sup>11</sup> Executive Order 9633.

<sup>12</sup> Peterson, 241.

<sup>13</sup> United Nations. General Assembly Resolution, *International Co-Operation in the Peaceful Uses of Outer Space*, 1st Committee, 14th Session, 1980th meeting, December 11, 1959, 5.

<sup>14</sup> Peterson, 259.

<sup>15</sup> CGSC Survey 15-03-034, April 14, 2015 (Appendix B), 25.

<sup>16</sup> Peterson, 247, 259; Gilson, 1394-1401.

<sup>17</sup> House, *Written Testimony of Joanne I Gabrynowicz Before the Subcommittee on Space of the Committee on Science, Space, and Technology*, September 10, 2014, 12; Outer Space Treaty, Article I

<sup>18</sup> *Hearing before the Congressional Space Subcommittee*, H.R. 5063

<sup>19</sup> House, *Written Testimony of Joanne I Gabrynowicz*, 2.

<sup>20</sup> Congress.Gov, “ASTEROIDS Act,” accessed April 15, 2015, <https://www.congress.gov/bill/113th-congress/house-bill/5063/all-actions>.

<sup>21</sup> National Space Policy of the United States, 2-4

<sup>22</sup> House, *Statement of Mark V. Sykes*, 12; House, *Written Testimony of Joanne I Gabrynowicz*, 2.

<sup>23</sup> *Ibid.*, 12.

<sup>24</sup> Lamar Smith, *Statement Hearing on Exploring Our Solar System: The ASTEROIDS Act as a Key Step*, 113th cong., July 10, 2014, 1.

<sup>25</sup> Miles Yu, “Russia and China Aim for the Moon and a Joint Lunar Base,” *The Washington Times*, accessed May 8, 2015, <http://www.washingtontimes.com/news/2015/may/7/inside-china-china-russia-to-build-moon-base>.

<sup>26</sup> CGSC Survey 15-03-034, April 14, 2015, (Appendix B), 33.

<sup>27</sup> *Ibid.*

## CHAPTER 5

### CONCLUSIONS

The purpose of this research is to contribute to the knowledge of evolving space policy specifically in terms of commercializing resource acquisitions in space. U.S. interpretations of the Outer Space Treaty, UN Convention on the Law of the Sea (UNCLOS), and the Antarctic Treaty may provide a foundation of precedence in how the U.S. will proceed with future commercial resource acquisitions in the common access domain of space. The conclusions reached in chapter 5, which consolidate the answers from the primary and secondary research questions, should provide insight to what precedents have been established within open access areas, further need of research to prepare the U.S. military for the next space race, and possible international responses if the U.S. proceeds to legalize commercial activities in space mining operations.

#### Interpretation of Results

Interpretation of analysis will be presented in a similar manner to information presented in chapter 4, and will be broken down into four separate categories. The survey demographics will be left out of the conclusions section as its primary purpose was to provide validity to analysis.

#### Common Heritage of Mankind, Similar Principles, and What Has Been Adopted by the U.S.

The primary research question for this study was to compare similarities and differences between current and proposed Space Laws with other international treaties that conceptualize the common heritage principle, specifically UNCLOS and the

Antarctic Treaty. Emphasis focused on if the U.S. has established precedence in historical endorsement of commercial resource acquisition in areas designated outside of international jurisdiction.

Currently, the U.S. does not recognize the international definition of the common heritage principle. The only treaties in existence today defining the common heritage principle, namely UNCLOS IV and the Moon Agreement, have not been ratified by the U.S. In not adopting either of these policies the U.S. definition regarding the common heritage principle remains ambiguous and allows flexibility within international politics.

The principle of common access areas does remain firm throughout the international community, and within U.S. law. This principle is intentionally used throughout the Antarctic treaty and Outer Space Treaty of 1967, which the U.S. is party to. The primary research question can still be answered with the substitution of the common heritage principle with the common access definition. However, trying to prove precedence between common access areas without the use of the common heritage principle is more difficult, as the definition of common access does not imply the same restrictions adhered to by the rest of the International Community.

#### U.S. Actions Establishing, or Denying, Precedence for the Allowance of Space Mining

As indicated by the analysis in chapter four, precedence has not been established by U.S. actions, or court rulings, that would present a case for the U.S. to permit space mining based on either the common heritage principle or the areas of common access definition. Each area of common access, namely the high seas, space, and Antarctica, are treated differently by the U.S. and most of the international community.

## High Seas

Current U.S. law for mining resources in the common access area of the high seas was established in 1945 with President Truman's executive order 9633, "Policy of the United States with Respect to the Natural Resources of the Subsoil and Sea Bed of the Continental Shelf."<sup>1</sup> This order claims all natural resources on the U.S. continental shelf as belonging to the U.S. The U.S. is not party to UNCLOS and therefore does not recognize the common heritage principle that has been adopted by most of the world.

Due to these circumstances, there are no corresponding ties to the mining of space. Any claims by the U.S. on the high seas fall within the parameters of executive order 9633. Debate between both the Departments of State and Defense with the U.S. Senate are ongoing as to whether the U.S. should become a participant of UNCLOS.<sup>2</sup> The debates have been ongoing since 1994 when the U.S. became a signatory of the convention, but the action has yet to be ratified by the Senate. If the Senate does ratify the convention precedent may be established, but may just as well be ignored. Precedent set by the ratification of the convention would grant an international organization, much like the International Seabed Authority in the case of the high seas, oversight of U.S. actions within an area of common access. While most of the international community is willing to accept international oversight established within UNCLOS, the U.S. is not. Additionally, a majority of the international community is not willing to have the same oversight in other areas of common access, namely space. Such a precedent is one of the primary reasons why the Moon Agreement was such a failure.

## Antarctica

Unlike the high seas, the Antarctic treaty was signed, and ratified, in 1960 by President Eisenhower and the U.S. senate.<sup>3</sup> Currently, the Antarctic treaty does not allow any commercial mining endeavors within this area of common access.<sup>4</sup> By doing so, it prevents the treaty from being used as precedence for commercial space mining. The treaty does allow for future amendments, but no amendments have been made to allow for exploitation of resources outside of scientific intent. If a future amendment is made to allow commercial mining operations within Antarctica precedent would then be established. However, precedent set may be ignored for other areas of common access, much like most of the world disregarded the Moon Agreement.

## Section Summary

Evidence gathered from analyzing data provided is the U.S. does not want to tie these common access areas together with the international definition of the common heritage principle. Doing so would severely limit the U.S. in each area. By keeping common access areas separate within the international arena, each having its own interpretations and codes of conduct, the U.S. keeps possibilities open to meet strategic interests. By doing so this allows the U.S. to use either the high seas or Antarctic analogies to support possible future negotiations within the area of space.

### The ASTEROIDS Act and What It Does, and Does Not, Do

The introduction of the ASTEROIDS act in July 2014 is a vital step forward in U.S. space policy. Any form this bill may take as it evolves through congressional debate is necessary to establish a legal foundation for a current gap within the U.S. legal

infrastructure. Current speculation regarding authorities granted by the Outer Space Treaty for commercial mining rights in space will be clearly defined. As it currently stands, the U.S. has not intentionally declared they have the right to license any commercial entity for extracting resources in space. Additionally, in refusing to sign the Moon Agreement the U.S. has not declared it has the authority to license commercial entities. This answers secondary research question number 5 and 7.

Additionally, the introduction of the ASTEROIDS act proves the U.S. does not have an existing legal precedence allowing the licensing of commercial entities to mine in space. The significance of introducing the ASTEROIDS Act to congress should not be overlooked. Technology is being rapidly developed throughout the world with the intent to extract resources from near earth objects. The U.S. is not alone in this endeavor, and is competing with other space faring nations. The major obstacle at this point is the lack of U.S. legal, and administrative, oversight on commercial companies. The next logical step to grant the U.S. the best chance in winning this space race is the adoption of such a bill.

#### International Response to U.S. Pursuance of Legalizing Commercial Space Mining

Chapter 4 identified the probable outcome if the U.S. was to adopt a bill much like the ASTEROIDS Act. It is generally accepted that non-space faring nations currently party to the Moon Agreement would protest such actions. However, it remains unclear how other space faring nations, specifically the five UN veto powers, would react. This is a gap in current literature that would be of great benefit to the U.S.

### Areas for Further Study

The primary objective of this paper was to determine if the U.S., by matter of precedence, could lawfully authorize commercial space mining. While this paper has proven that precedence cannot be claimed, there are several areas of continued study that must be considered regarding international strategic impacts if the U.S. pursues commercial mining in space.

First, a comprehensive study of foreign objectives in large scale space mining endeavors should be made. This would include objectives and purposes of resources collected that may influence current geopolitical standings, and if foreign nations would utilize commercial or governmental programs to meet these objectives. A comparative study of existing technologies and objectives between the U.S. and other space faring nations could be used to indicate probable timelines, opportunities, and threats to the U.S. interests.

Second, further study needs to be conducted on possible international responses if the U.S. passes the ASTEROIDS act, or a bill similar to it. This paper has already determined nations who have ratified the Moon Agreement would likely raise objections. However, no studies currently exist on likely responses by existing space faring nations, especially the other four UN powers who retain veto authority (France, the United Kingdom, Russia, and China), if the U.S. were to unilaterally grant authority to commercial entities to mine in space.

Third, of the three areas of common access studied the most contentious to date is the High Seas, even among U.S. politicians. Further research is needed to compare

benefits and costs of U.S. ratification of UNCLOS IV and how that would impact the U.S. military, specifically in its interactions within the pacific theater.

Fourth, a study should be made on impacts of ratifying UNCLOS IV and possible impacts this ratification may have on space policy, specifically with the adoption of a clearly defined common heritage principle, and how this may impact future UN oversight as the U.S. would then have recognized the International Seabed Authority as a legal international entity over U.S. affairs.

Fifth, a study should be made on the feasibility and economic cost benefit of bringing mined materials back to earth for refinement, or establishing a NEO ISRU in space. There is current debate within the scientific community as how to best proceed, and the impacts this could have on space exploration, military operations, and legal ownership of resources mined.

Sixth, a study should be made how international law may impact the current arctic situation. Is the Arctic considered a different open access area or does it fall under the UNCLOS? How would either scenario currently impact geopolitics in the region?

### Conclusion

The study of evolving U.S. and international policy is vital in order for the U.S. to maintain its lead in the frontier of space. What was once believed to be science fiction is quickly becoming reality. What is currently holding mankind back is a lack of governmental infrastructure and updated policies that will allow future exploration, and exploitation, of space. Commercial mining in the common access area of space is the next logical step in our national progression as a global leader. While precedence does not

exist that would allow for solid argument in U.S. commercialization of space resource acquisition, laws and infrastructure need to be established in order to proceed.

---

<sup>1</sup> Executive Order 9633.

<sup>2</sup> Senate, *The Law of the Sea Convention*.

<sup>3</sup> U.S. President, Antarctic Treaty.

<sup>4</sup> Ibid.

## Appendix A

### CGSC Survey 15-03-034: Questions Posed

#### Common Access Areas and the Future of Commercial Space Endeavors

Page 1 of Survey

The purpose of this survey is to gather information from subject matter experts regarding the United States interpretations of, and actions within, areas designated as 'Common Heritage of Mankind.'

This survey is voluntary and completely confidential, and will take about 15-20 minutes to complete. This survey does answer the requirements necessary for the Masters in Military Arts and Sciences.

For questions or concerns regarding the survey, please contact Dr. Maria Clark, the Human Protections Administrator, at maria.l.clark.civ@mail.mil.

This Survey has been reviewed and approved by the Quality Assurance Office. The Survey control number is 15-03-034.

#### Commercialization of Space and the Common Heritage of Mankind

Page 2 of Survey

What is your current association with Space Policy? (Check all that apply)

{Choose all that apply}

- Academic/Professor
- Business Entity
- Law Maker
- Contributor to International Space Policy
- Other

What is your highest level of education?

{Choose one}

- Bachelors
- Masters
- Doctorate
- Law Degree

Page 3 of Survey

What is your level of knowledge in the following national/international policies?

United Nations Convention on the Law of the Sea

{Choose one}

- None
- Some Knowledge
- Moderate Knowledge
- Expert Knowledge

US National Space Laws

{Choose one}

- None
- Some Knowledge
- Moderate Knowledge
- Expert Knowledge

UN Space Treaties

{Choose one}

- None
- Some Knowledge
- Moderate Knowledge
- Expert Knowledge

Antarctic Treaty

{Choose one}

- None
- Some Knowledge
- Moderate Knowledge
- Expert Knowledge

Page 4 of Survey

Is there a difference in definitions between the terms 'Common Access Areas' and 'Common Heritage of Mankind' by the United States Government?

{Choose one}

- Yes
- No
- Unknown

Explain

{Enter answer in paragraph form}

Do all areas designated by the United States as 'Common Heritage of Mankind' have the same restrictions for commercial mining?

{Choose one}

- Yes
- No
- Unknown

Explain

{Enter answer in paragraph form}

#### Page 5 of Survey

Is there historical precedence of the US licensing commercial entities to mine resources in areas designated as 'Common Heritage of Mankind'?

{Choose one}

- Yes
- No
- Unknown

Explain

{Enter answer in paragraph form}

#### Page 6 of Survey

Is there a common understanding throughout the international community that commercial mining should be regulated by an international authority in areas considered 'Common Heritage of Mankind'?

{Choose one}

- Yes
- No
- Unknown

Explain

{Enter answer in paragraph form}

#### Page 7 of Survey

Does refusing to sign the Moon Treaty indicate that the United States retains the right to license commercial entities to mine resources in space?

{Choose one}

- Yes
- No
- Unknown

Explain

{Enter answer in paragraph form}

Does the United States continued adherence to the 1945 proclamation 2667, "Policy of the United States With Respect to the Natural Resources of the Subsoil and Sea Bed of the Continental Shelf," provide a precedence for US commercial companies to mine in space?

{Choose one}

- Yes
- No
- Unknown

Explain

{Enter answer in paragraph form}

Page 8 of Survey

Do current space treaties, signed and ratified by the United States, grant international consent to the U.S. issuing commercial licenses for mining in space?

{Choose one}

- Yes
- No
- Unknown

Explain

{Enter answer in paragraph form}

Page 9 of Survey

Does the Antarctic Treaty remain a viable comparison for future applications to Space Law?

{Choose one}

- Yes
- No
- Unknown

Explain

{Enter answer in paragraph form}

Does the current United Nations Convention on the Law of the Sea remain a viable comparison for future applications to Space Law?

{Choose one}

- Yes
- No
- Unknown

Explain  
{Enter answer in paragraph form}

Page 10 of Survey

Do precedents exist within national law that clearly explain the US authority to license commercial entities to mine in space?

{Choose one}

- Yes
- No
- Unknown

How necessary is the proposal of the ASTEROIDS act?

{Enter answer in paragraph form}

How would the currently proposed ASTEROIDS act (if passed into law) indicate the United States interpretation of Outer Space Treaty?

{Enter answer in paragraph form}

Page 11 of Survey

Would there be a negative response from the international community if the United States were to issue commercial mining licenses without further refinement of current space policies?

{Choose one}

- Yes
- No
- Unknown

Explain  
{Enter answer in paragraph form}

Page 12 of Survey

The space below is made available if you would like to provide a quote, or any additional information, to be included in my thesis. This will in no way degrade the confidentiality of this survey. If you provide additional information, and wish to be quoted, please include your name and title.

{Enter answer in paragraph form}

Appendix B

CGSC Survey 15-03-034: Aggregate Summary Report

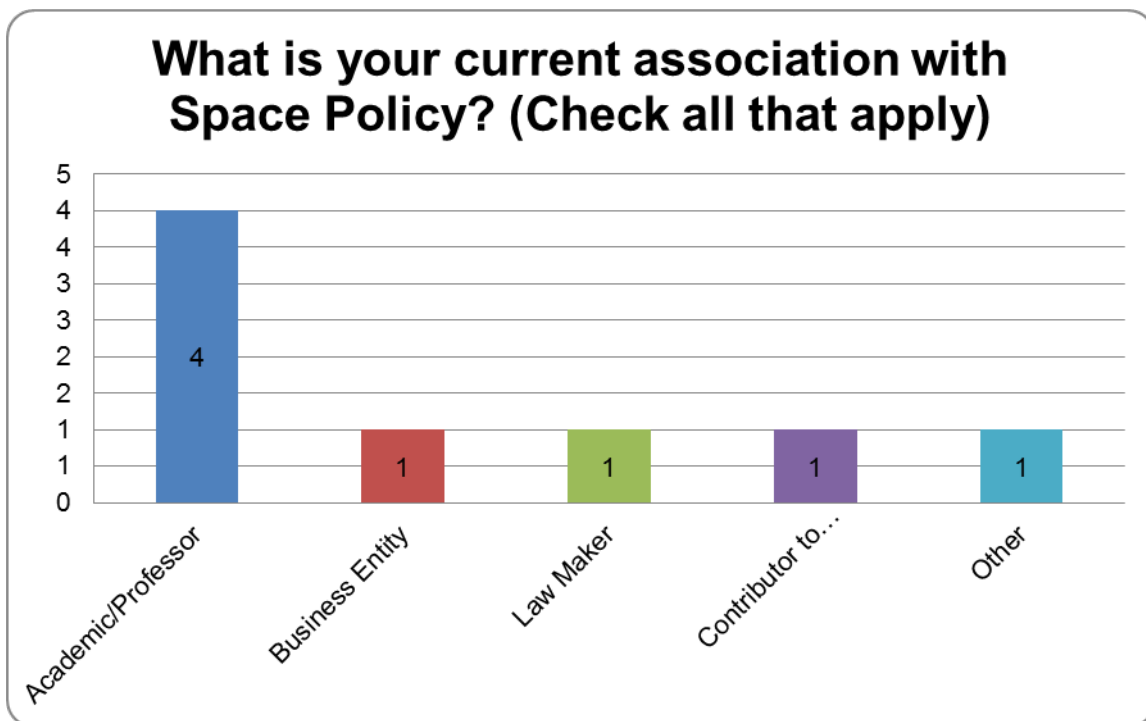
Common Access Areas and the Future of Commercial Space Endeavors

Published Tuesday, April 7, 2015

What is your current association with Space Policy? (Check all that apply)

Response Rate: **100% (N=5)** Question Type: **Choose many**

Academic/Professor	4
Business Entity	1
Law Maker	1
Contributor to International Space Policy	1
Other	1
<b>Total Responses</b>	<b>8</b>



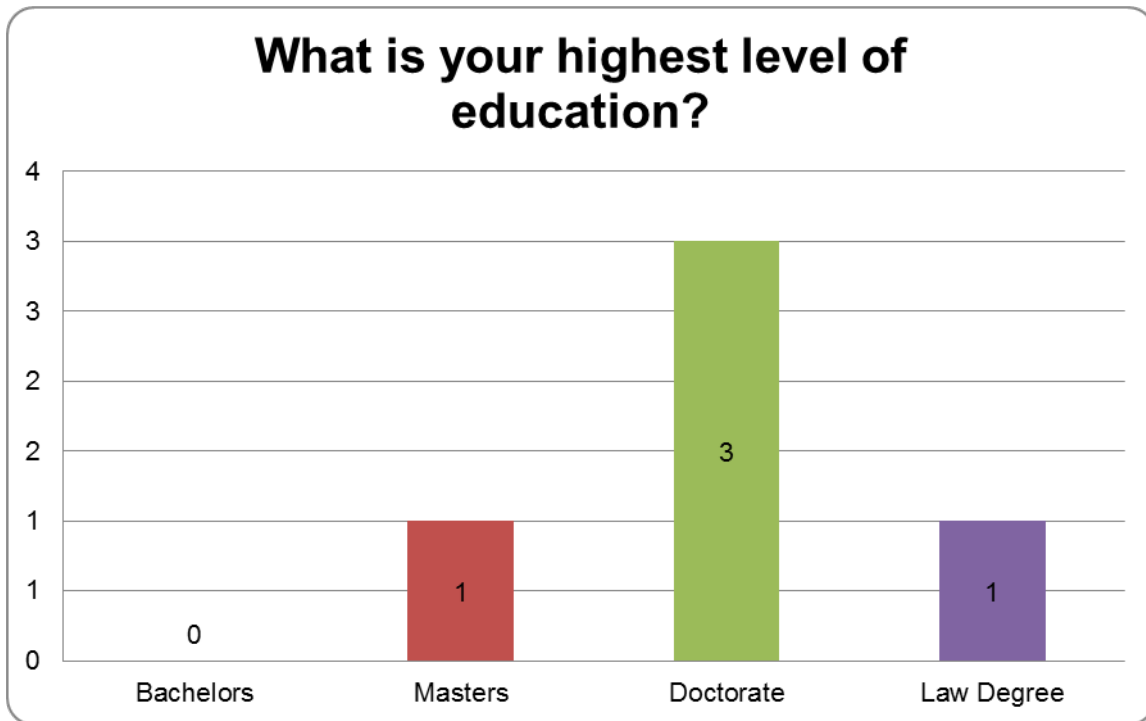
Other Responses

now retired	1
<b>Total Responses</b>	<b>1</b>

What is your highest level of education?

Response Rate: 100% (N=5) Question Type: Choose one

Bachelors	0
Masters	1
Doctorate	3
Law Degree	1
<b>Total Responses</b>	<b>5</b>

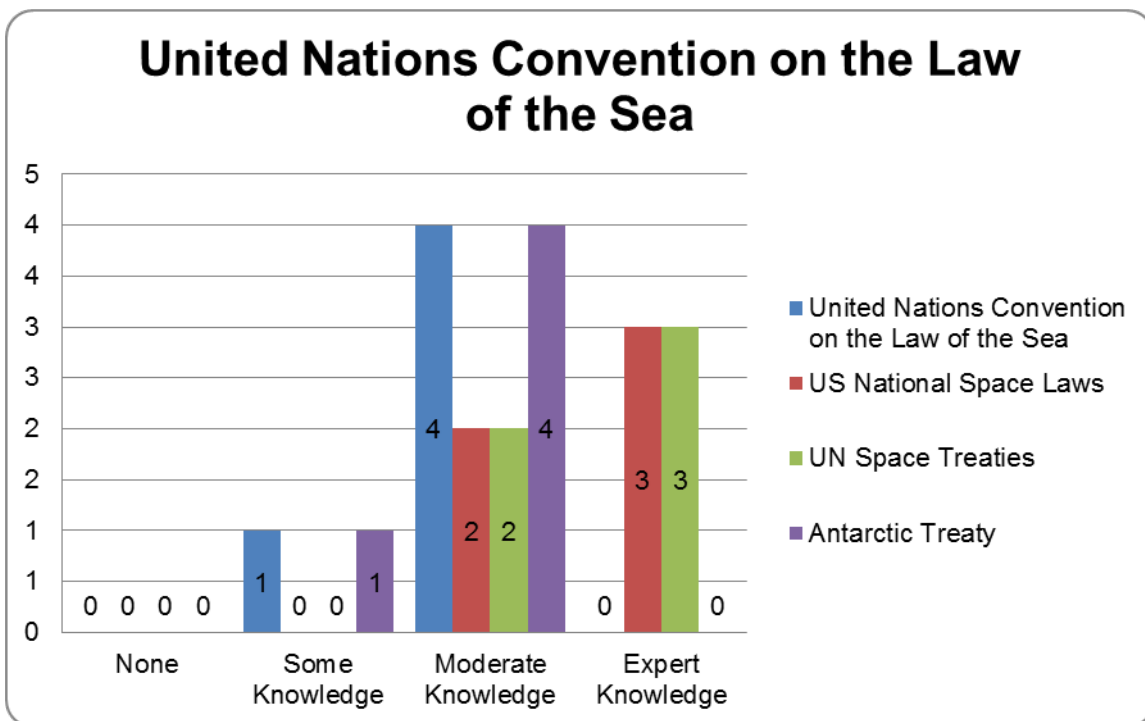


What is your level of knowledge in the following national/international policies?

Scale 1

Question Type: Choose one

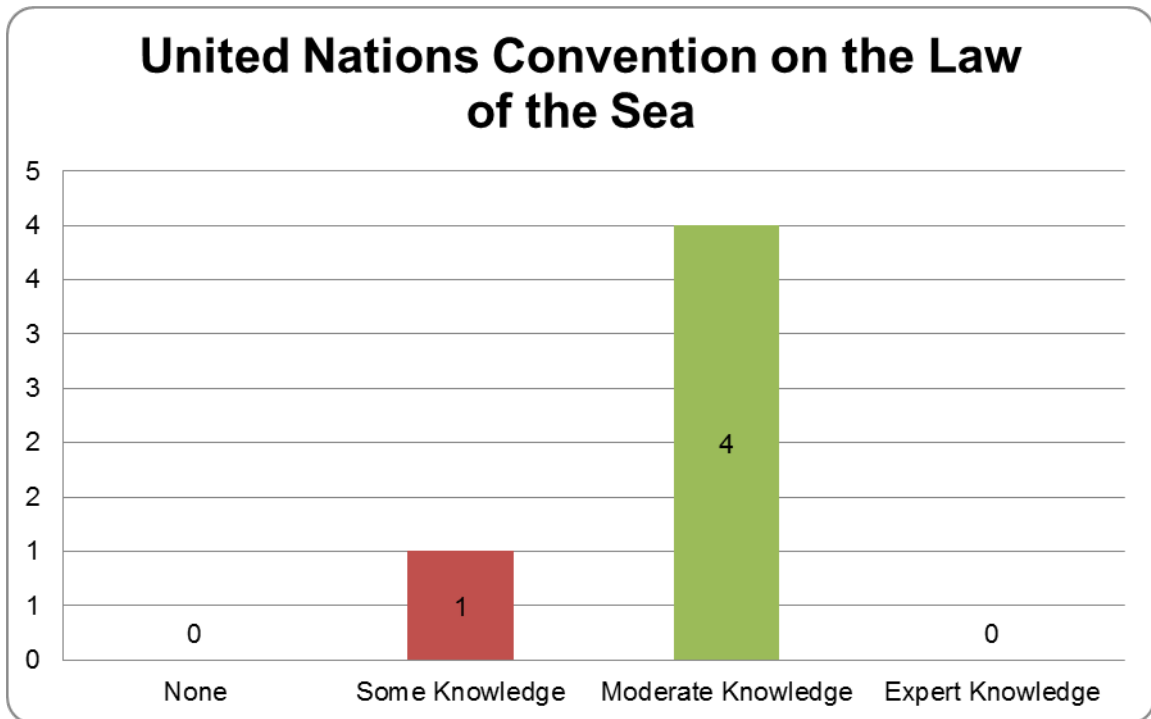
	None	Some Knowledge	Moderate Knowledge	Expert Knowledge	Total Responses
United Nations Convention on the Law of the Sea	0	1	4	0	5
	0%	20%	80%	0%	
US National Space Laws	0	0	2	3	5
	0%	0%	40%	60%	
UN Space Treaties	0	0	2	3	5
	0%	0%	40%	60%	
Antarctic Treaty	0	1	4	0	5
	0%	20%	80%	0%	
<b>Total Responses</b>	<b>0</b>	<b>2</b>	<b>12</b>	<b>6</b>	<b>20</b>



## United Nations Convention on the Law of the Sea

Response Rate: 100% (N=5) Question Type: Choose one

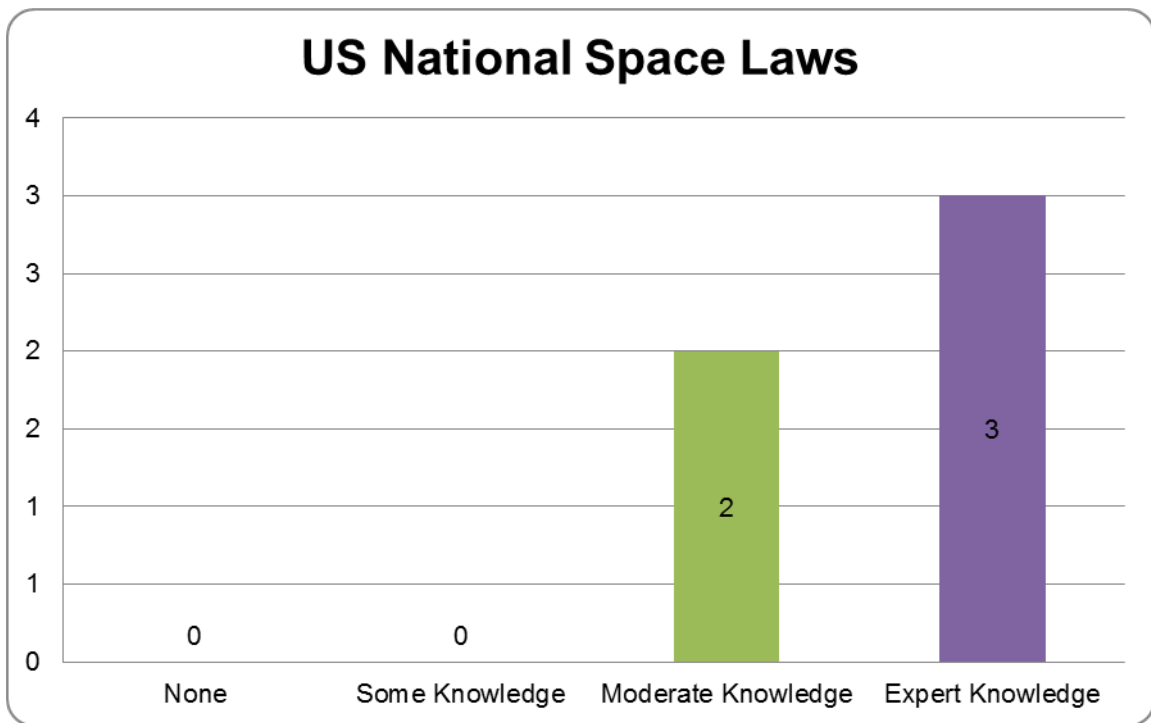
None	0
Some Knowledge	1
Moderate Knowledge	4
Expert Knowledge	0
<b>Total Responses</b>	<b>5</b>



## US National Space Laws

Response Rate: 100% (N=5) Question Type: Choose one

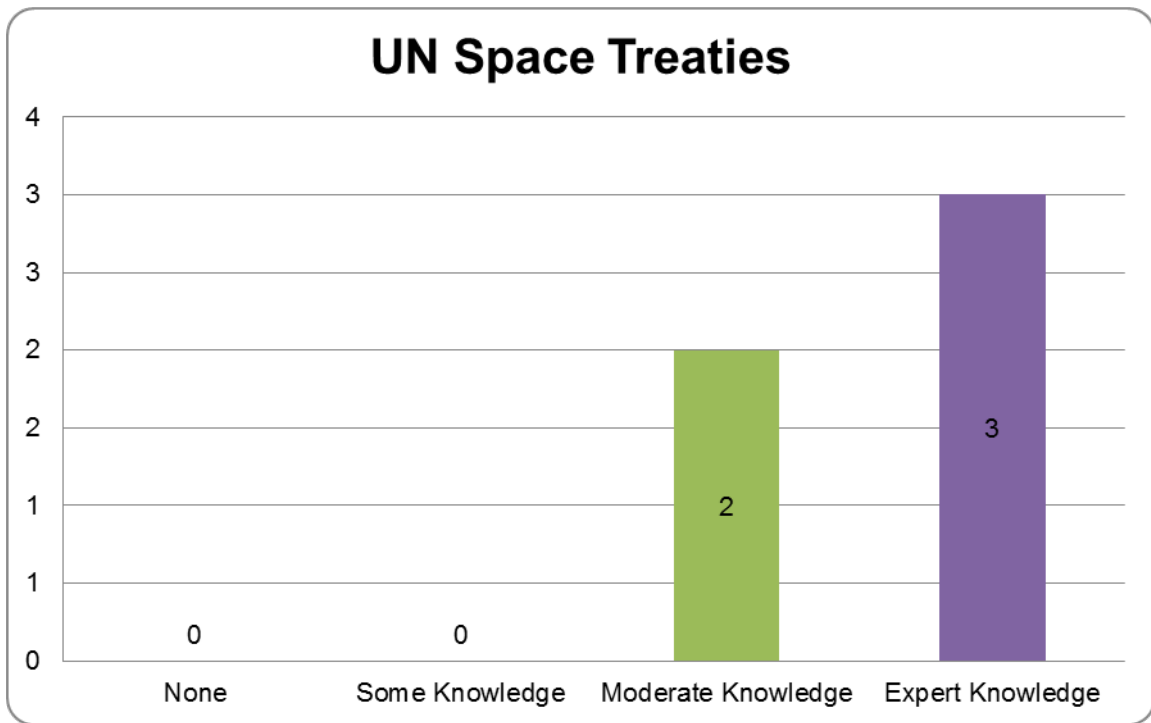
None	0
Some Knowledge	0
Moderate Knowledge	2
Expert Knowledge	3
<b>Total Responses</b>	<b>5</b>



## UN Space Treaties

Response Rate: 100% (N=5) Question Type: Choose one

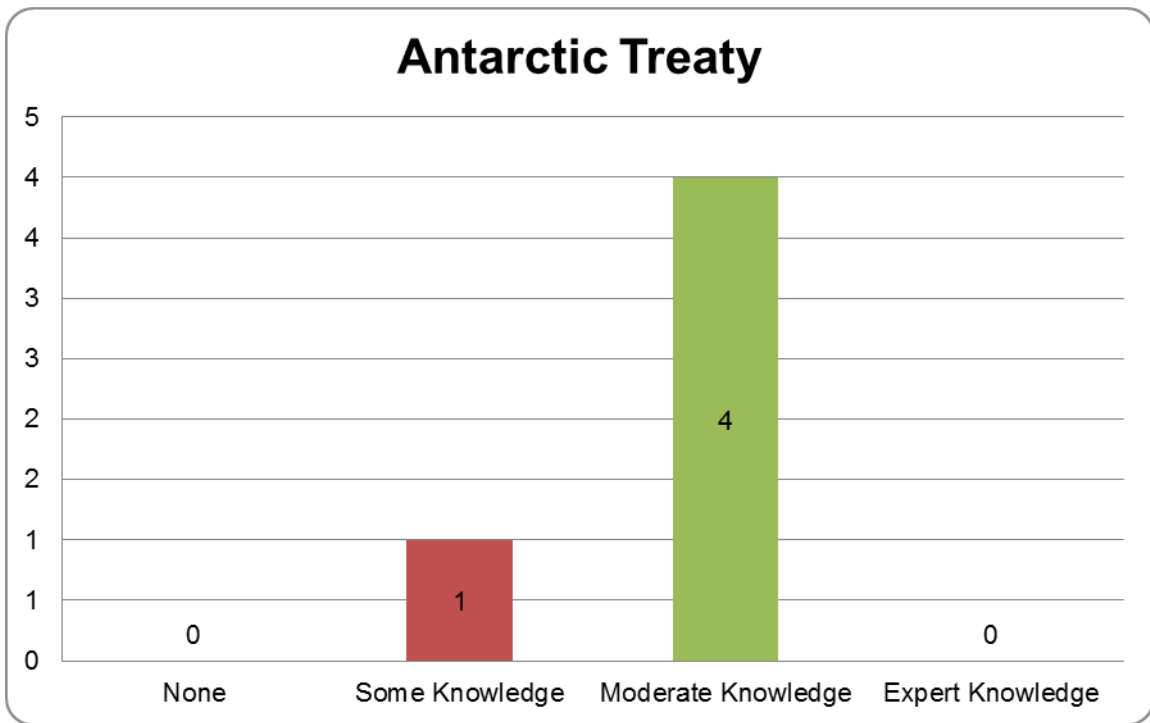
None	0
Some Knowledge	0
Moderate Knowledge	2
Expert Knowledge	3
<b>Total Responses</b>	<b>5</b>



## Antarctic Treaty

Response Rate: 100% (N=5) Question Type: Choose one

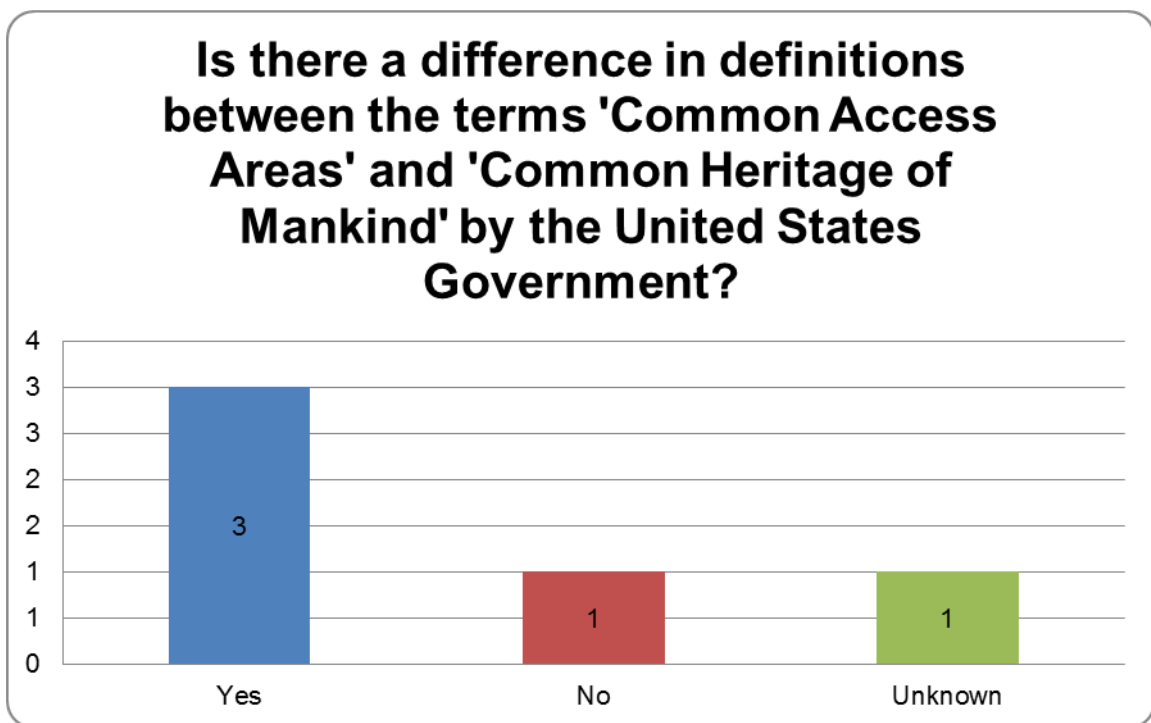
None	0
Some Knowledge	1
Moderate Knowledge	4
Expert Knowledge	0
<b>Total Responses</b>	<b>5</b>



Is there a difference in definitions between the terms 'Common Access Areas' and 'Common Heritage of Mankind' by the United States Government?

Response Rate: 100% (N=5) Question Type: Choose one

Yes	3
No	1
Unknown	1
<b>Total Responses</b>	<b>5</b>



Explain

Response Rate: 20% (N=1) Question Type: Paragraph

---

Common access areas are open to use by all equally, such as the high seas. Common heritage means all people have an indivisible access right as owners and users of a resource. Exploitation of common heritage resources must be shared with all on an equitable basis. In work on UN treaties I always sought to have "equitable" understood as "fairly earned", not equally apportioned.

---

**Total Responses: 1**

Do all areas designated by the United States as 'Common Heritage of Mankind' have the same restrictions for commercial mining?

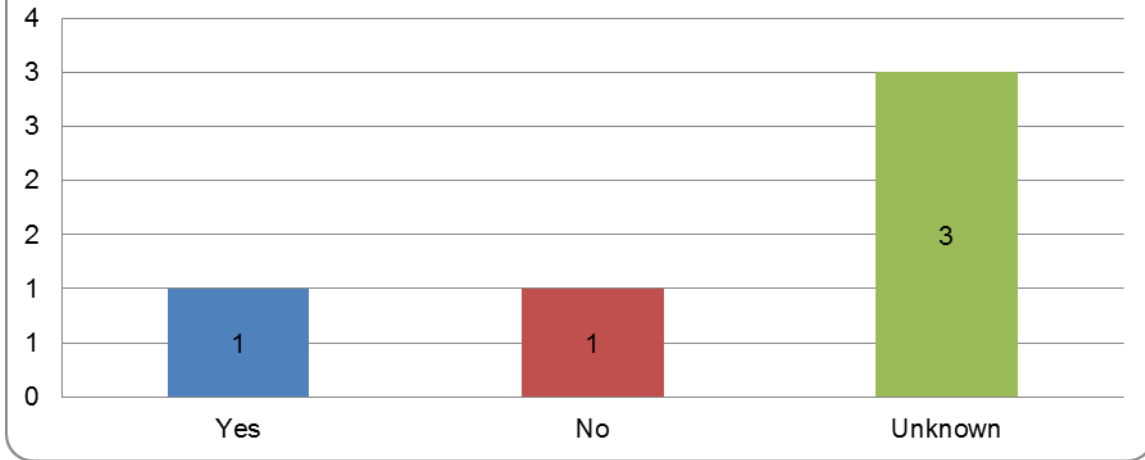
Response Rate: 100% (N=5) Question Type: Choose one

---

Yes	1
No	1
Unknown	3
<b>Total Responses</b>	<b>5</b>

---

**Do all areas designated by the United States as 'Common Heritage of Mankind' have the same restrictions for commercial mining?**



Explain

Response Rate: 60% (N=3) Question Type: Paragraph

---

The U.S. has not designated areas as the "Common Heritage of Mankind". Explanation: It is not party to the UN Law of the Sea Convention and the Moon Agreement, which do include the "Common Heritage of Mankind" principle

---

common heritage is a highly ambiguous concept whose meaning is not defined.

---

As far as I am aware the deep sea bed is the only area where this claimed right applies by virtue of international law. Attempts to apply it to the resources of the Moon resulted in failure of the Moon Treaty to gain significant signatures and ratifications.

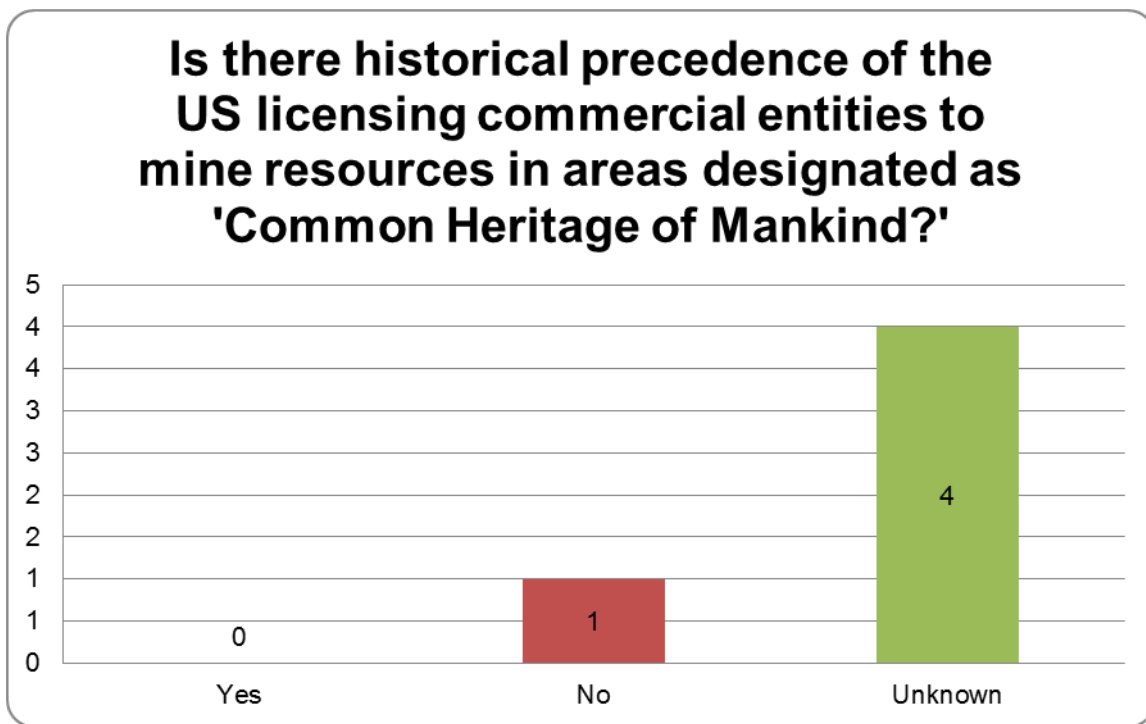
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**Total Responses: 3**

Is there historical precedence of the US licensing commercial entities to mine resources in areas designated as 'Common Heritage of Mankind?'

Response Rate: 100% (N=5) Question Type: Choose one

Yes	0
No	1
Unknown	4
<b>Total Responses</b>	<b>5</b>



Explain

Response Rate: 20% (N=1) Question Type: Paragraph

Not to my knowledge, because no rational commercial venture owner(s) would seek to exploit resources it must share with all mankind regardless of others' contribution to the effort to exploit. when men take fish from the sea they own the harvested fish. When men reduce regolith on the Moon to useful form, they should own the resultant products. The vast majority of Third World nations believe they have an ownership right in the

---

Moon. The US sees the Moon as a common access area, not a common heritage.

---

**Total Responses: 1**

Explain

Response Rate: 40% (N=2) Question Type: Paragraph

---

There is no common understanding about anything that involves the "Common Heritage of Mankind". Opinion is highly divided along political lines.

---

I believe this is a highly contentious issue. The Third World nations are united in their opinion about what is common heritage and what should be considered in that sphere. Most of the developed countries of the world do not share this view. The division of opinion is eminently clear when you consider the ratifications in place for the 1967 Space Treaty and the Moon Treaty. Many of the developed nations now recognize the precedent represented by the Law of the Sea Treaty and are not willing to go that route again.

---

**Total Responses: 2**

Is there a common understanding throughout the international community that commercial mining should be regulated by an international authority in areas considered 'Common Heritage of Mankind'?

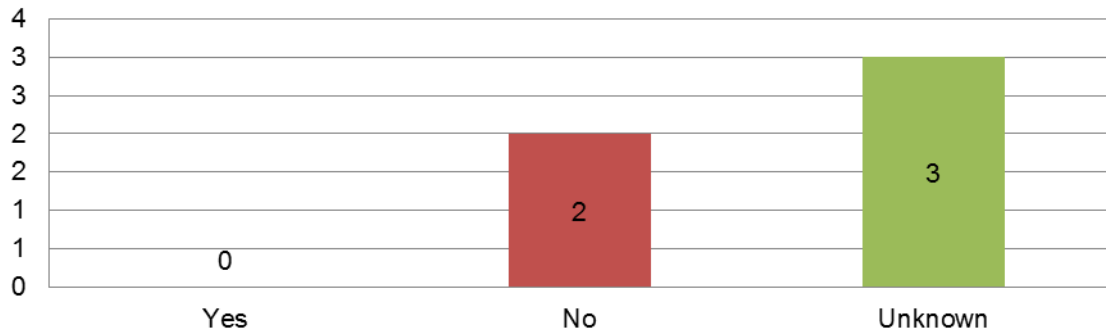
Response Rate: 100% (N=5) Question Type: Choose one

---

Yes	0
No	2
Unknown	3
<b>Total Responses</b>	<b>5</b>

---

**Is there a common understanding throughout the international community that commercial mining should be regulated by an international authority in areas considered 'Common Heritage of Mankind'?**

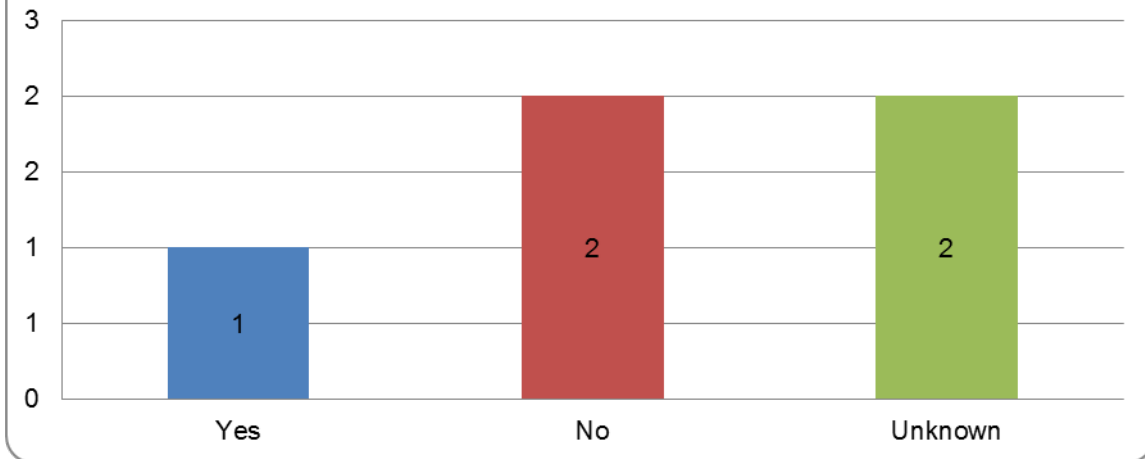


Does refusing to sign the Moon Treaty indicate that the United States retains the right to license commercial entities to mine resources in space?

Response Rate: 100% (N=5) Question Type: Choose one

Yes	1
No	2
Unknown	2
<b>Total Responses</b>	<b>5</b>

**Does refusing to sign the Moon Treaty indicate that the United States retains the right to license commercial entities to mine resources in space?**



Explain

Response Rate: 40% (N=2) Question Type: Paragraph

---

This is an entirely unclear issue. Please see my testimony to Congress on this question. You can download it at <http://science.house.gov/hearing/subcommittee-space-exploring-our-solar-system-asteroids-act-key-step> Click on my name.

---

So long as the international community does not come together to form a rule of law recognized as an international consensus established as "traditional international law", this will be the case. When actual exploitation begins, we may anticipate another surge of the proponents of the common heritage principle; the necessary response to such an approach must be to emphasize that "equitable distribution" must be based upon a contribution to the effort of exploitation, such as money, manpower and/or materials.

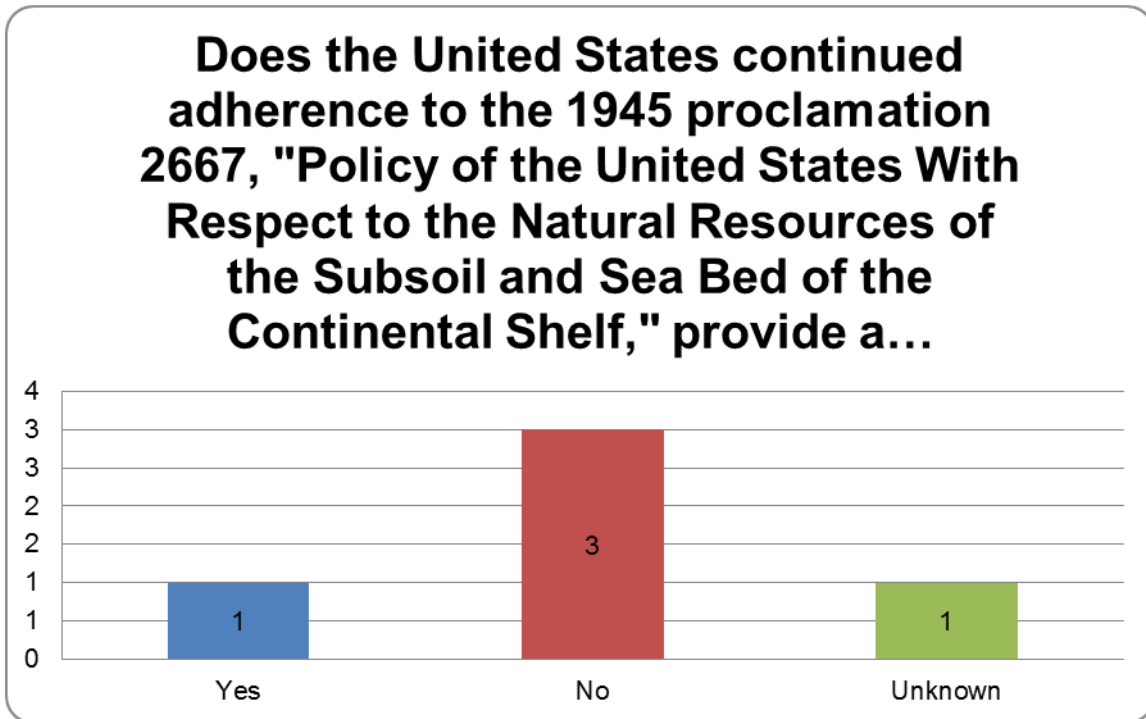
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**Total Responses: 2**

Does the United States continued adherence to the 1945 proclamation 2667, "Policy of the United States With Respect to the Natural Resources of the Subsoil and Sea Bed of the Continental Shelf," provide precedence for US commercial companies to mine...

Response Rate: 100% (N=5) Question Type: Choose one

Yes	1
No	3
Unknown	1
<b>Total Responses</b>	<b>5</b>



Explain

Response Rate: 20% (N=1) Question Type: Paragraph

---

It should not. Exploitation of resources in space should be controlled by the terms of the 1967 Space Treaty that grants all nations the right to explore and use outer space on the basis of equality, without reference to the economic status of participants, and that law should be maintained. Outer space is like the high seas. All nations have an equal right to explore and use outer space (and the resources there) on the basis of equality and compliance with international law, including the UN Charter. The Treaty on the Law of the Sea does not apply and should not apply in outer space.

---

**Total Responses: 1**

Do current space treaties, signed and ratified by the United States, grant international consent to the U.S. issuing commercial licenses for mining in space?

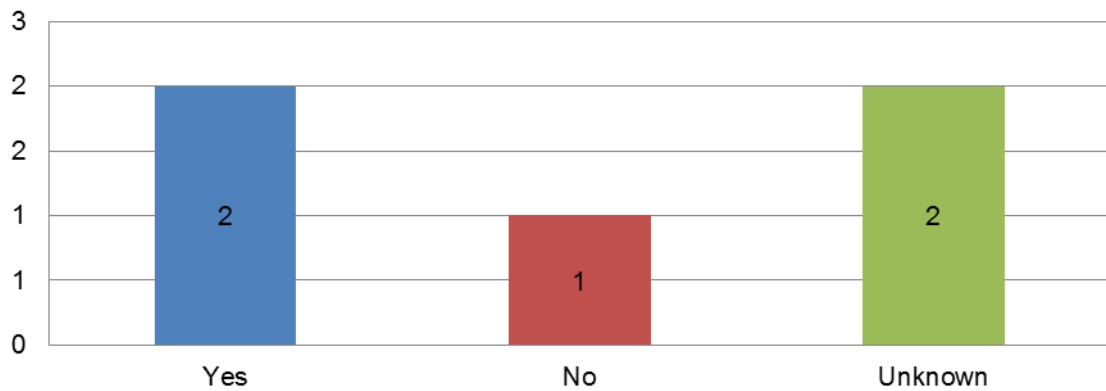
Response Rate: 100% (N=5) Question Type: Choose one

---

Yes	2
No	1
Unknown	2
<b>Total Responses</b>	<b>5</b>

---

**Do current space treaties, signed and ratified by the United States, grant international consent to the U.S. issuing commercial licenses for mining in space?**



Explain

Response Rate: 40% (N=2) Question Type: Paragraph

---

Cannot answer this question the way it is worded.

---

Article 6 of the 1967 OST is the basic authority for commercial entities to operate in outer space with appropriate authorization and supervision of the national government. There are no prohibitions in any of the treaties, save restrictions on selected and identified forms of military activities. There is no explicit "authorization" of mining, and there is no explicit prohibition or limitation on mining. the extant law is silent on this subject.

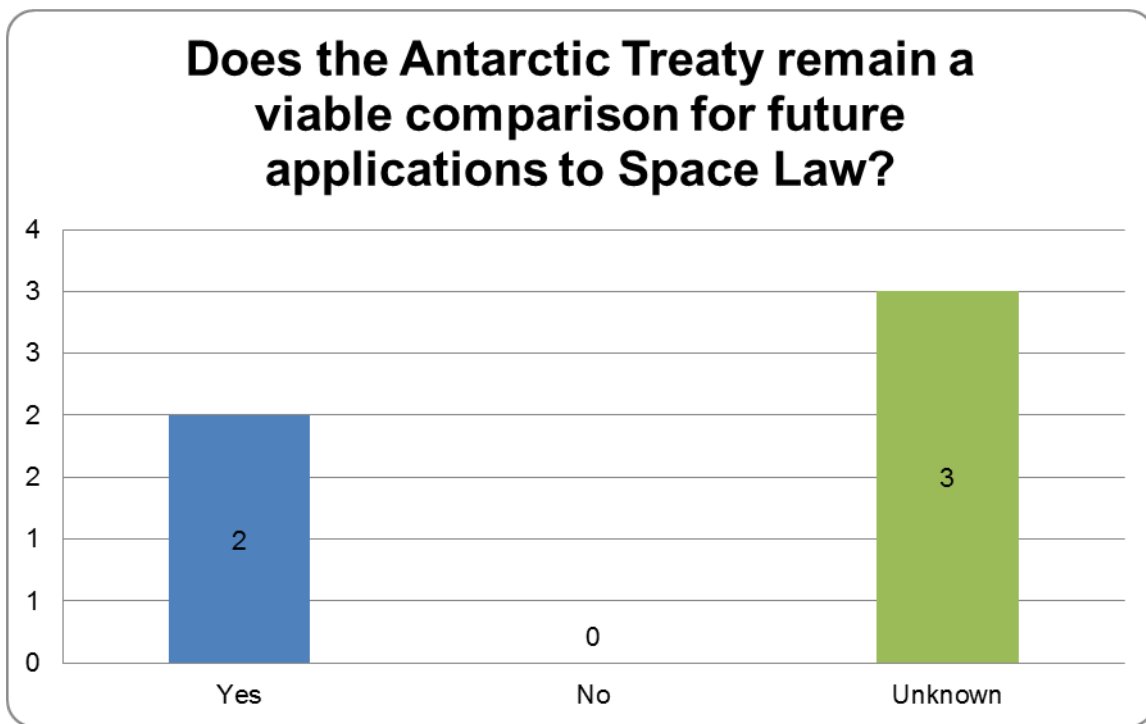
---

**Total Responses: 2**

Does the Antarctic Treaty remain a viable comparison for future applications to Space Law?

Response Rate: 100% (N=5) Question Type: Choose one

Yes	2
No	0
Unknown	3
<b>Total Responses</b>	<b>5</b>



Explain

Response Rate: 40% (N=2) Question Type: Paragraph

Ambiguous. It depends on what precedent is being argued.

The Antarctic Treaty of 1959 was established to restrain for a time any national claims to ownership of portions of Antarctica, while allowing all nations wishing to do so to explore the area on the basis of equality. This treaty may expire at some future time, but its provisions for equal rights to explore would probably not be considered a right to

exploit resources there. If exploitation of Antarctic resources were undertaken on a commercial scale, it's likely that the international community would step in, in a disruptive attempt to halt exploitation absent some agreement on sharing of benefits.

---

**Total Responses: 2**

Does the current United Nations Convention on the Law of the Sea remain a viable comparison for future applications to Space Law?

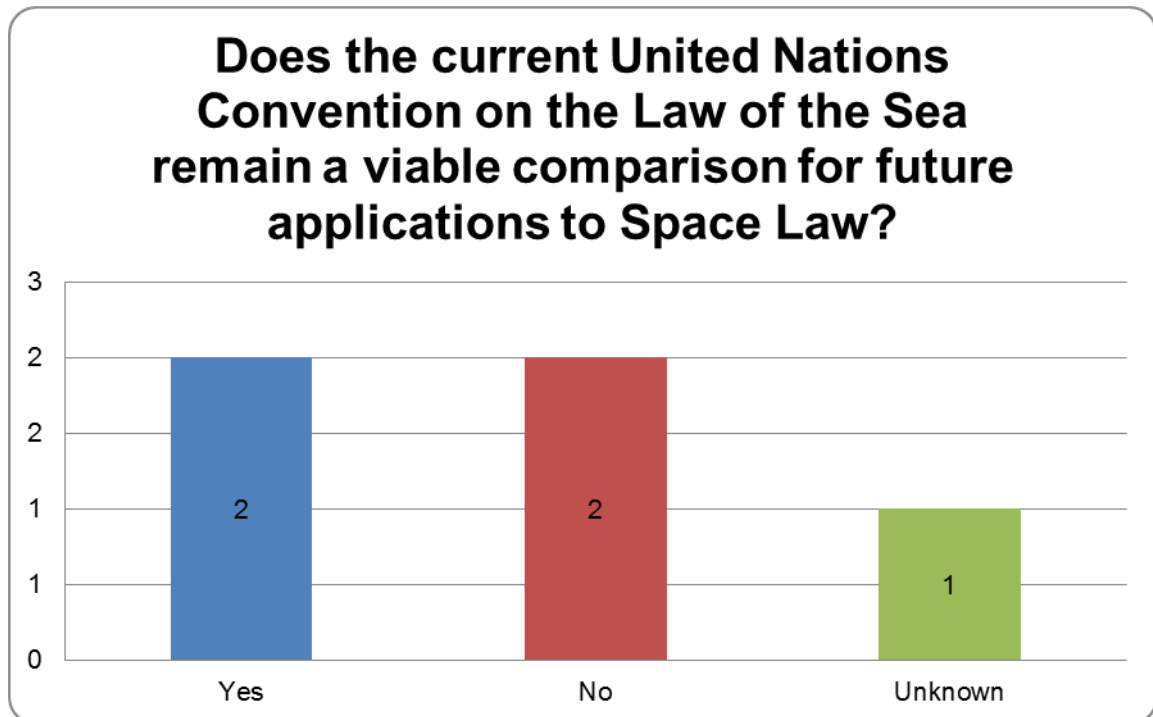
Response Rate: **100% (N=5)** Question Type: **Choose one**

---

Yes	2
No	2
Unknown	1

---

**Total Responses** 5



Explain

Response Rate: 40% (N=2) Question Type: Paragraph

---

See above

---

No, in connection with the issue of exploitation of resources the UNCLS never was a viable comparison for the 1967 OST, and I hope it never will be. This is what caused the failure of the Moon Treaty.

---

**Total Responses: 2**

Do precedents exist within national law that clearly explain the US authority to license commercial entities to mine in space?

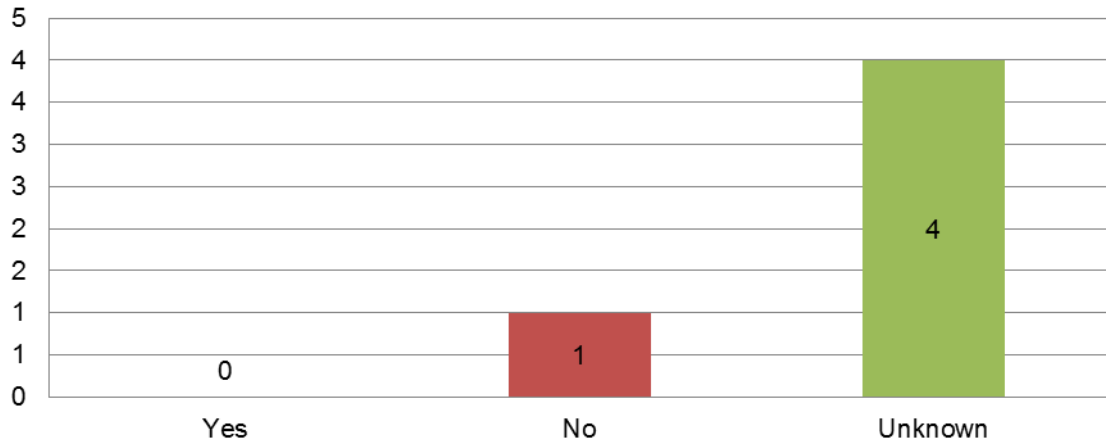
Response Rate: 100% (N=5) Question Type: Choose one

---

Yes	0
No	1
Unknown	4
<b>Total Responses</b>	<b>5</b>

---

**Do precedents exist within national law that clearly explain the US authority to license commercial entities to mine in space?**



How necessary is the proposal of the ASTEROIDS act?

Response Rate: 0% (N=0) Question Type: Paragraph

**Total Responses: 0**

How would the currently proposed ASTEROIDS act (if passed into law) indicate the United State's interpretation of Outer Space Treaty?

Response Rate: 20% (N=1) Question Type: Paragraph

The Asteroids Bill, if enacted would authorize the exploitation of asteroids commercially in compliance with rules and regulations propagated by the government. This law would provide for the authorization and supervision required under the 1967 OST, Article 6. The Bill clearly is consistent, as drafted, with the interpretation of the law as I presented it above.

**Total Responses: 1**

This box is available for you to provide additional comments if desired.

**Response Rate: 40% (N=2) Question Type: Paragraph**

---

Please see my testimony to Congress on this question. You can download it at <http://science.house.gov/hearing/subcommittee-space-exploring-our-solar-system-asteroids-act-key-step> Click on my name.

---

Not within domestic law necessarily, but from positive obligations of the US to provide continuing authorization and supervision under the Outer Space Treaty.

---

**Total Responses: 2**

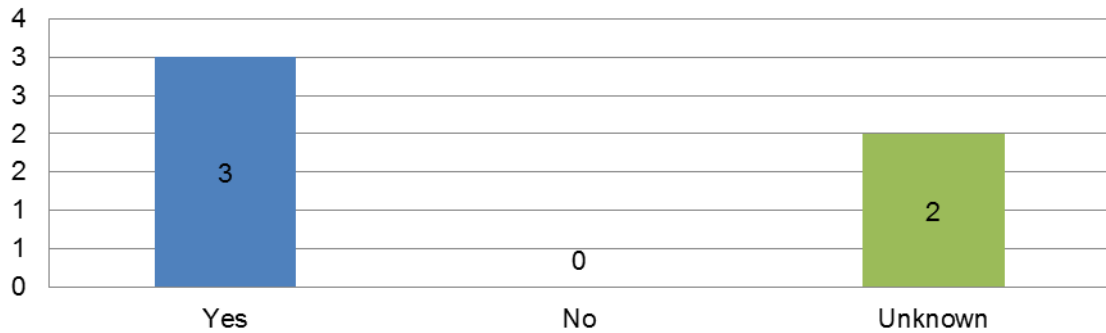
Would there be a negative response from the international community if the United States were to issue commercial mining licenses without further refinement of current space policies?

**Response Rate: 100% (N=5) Question Type: Choose one**

---

Yes	<b>3</b>
No	<b>0</b>
Unknown	<b>2</b>
<b>Total Responses</b>	<b>5</b>

**Would there be a negative response from the international community if the United States were to issue commercial mining licenses without further refinement of current space policies?**



Explain

Response Rate: 60% (N=3) Question Type: Paragraph

---

Please see my testimony to Congress on this question. You can download it at <http://science.house.gov/hearing/subcommittee-space-exploring-our-solar-system-asteroids-act-key-step> Click on my name.

---

Depends on what is meant by policies, which normally apply only to U.S. actions.  
Depends also on what is meant by negative response and significance.

---

I expect there would be a series of complaints from developing countries, but in terms of law, they can be ignored. Unless or until the major powers (i.e., the 5 UN Security Council veto powers) raised an objection, I think the US could and should proceed. If complaint is made by a major power, bilateral meetings should be established to explain the US position and possibly invite cooperation. Meetings could be held with Third World nations to explain the US position and invitations to cooperate could be issued there as well. But, based on experience, the smaller countries will whine a lot without offering any help.

---

**Total Responses: 3**

The space below is made available if you would like to provide a quote, or any additional information, to be included in my thesis. This will in no way degrade the confidentiality of this survey. If you provide additional information, and wish to be...

**Response Rate: 60% (N=3) Question Type: Paragraph**

---

Additional Comment: the subject of this survey is not amenable to the form of the survey questions. This is a difficult subject matter with very few clear answers.

---

Space is not a global commons. Such a term applies only to the high seas and the air above the high seas. A global commons has to be positively agreed to. The "common heritage of mankind" term is not sufficient to designate space a global commons.

---

You may quote any and all parts of my answers above, if you so wish. Stephen E. Doyle, Attorney, retired. Honorary Director, International Institute of Space Law Details of my career and writings are at [www.stephenedoyle.com](http://www.stephenedoyle.com). thank you for the opportunity to contribute.

---

**Total Responses: 3**

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