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Creating Contracts in a Vacuum: Space Mining and the Creation of Future Contract Law

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ABSTRACT

Asteroid mining is set to be one of the most lucrative industries of the near future. With mineral value that dwarfs resources found on Earth, the race to locate and mine these precious minerals will soon begin in earnest. However, asteroid mining raises numerous legal questions, including how to create contracts for private mining companies to exploit the asteroids. Standard mining contracts provide a foundation for earthbound contracts, while mining in extreme environments such as Antarctica and the seabed provides further structure upon which parties interested in asteroid mining can begin building new contracts. These earthbound contracts also serve as a laboratory for international regulation, cooperation, and oversight. The added challenge of existing outer space treaties, some of which are unratified by space-faring nations for fear of loss of sovereignty create a complicated path towards creating an empowered international agency that may oversee asteroid mining contracts. For asteroid mining to become a successful and regulated industry, the space-faring nations of the world must take existing international treaties and form an agency with power to arbitrate and regulate or risk the asteroid belt becoming a new gold rush where nations and private corporations claim asteroids and the riches that they contain at great risk to equipment, investments and life.

INTRODUCTION

In the vastness of space, there are countless celestial bodies that contain minerals, ores, and other precious metals which could usher in a new gold rush. While the focus of the space race has initially revolved around exploration and tourism, mining may prove to be the most lucrative venture. A single asteroid located in the belt between Mars and Jupiter has an estimated value of 10 quadrillion dollars based on its iron content alone.[1] There are millions of asteroids in the belt, and there are additional efforts to track their orbit, estimate the cost-effectiveness of mining the minerals, and provide insight into how much mining these literal gold mines

1. Monique Scotti, *NASA plans mission to a metal-rich asteroid worth quadrillions*, GLOBAL NEWS (Jan. 16, 2017, 12:39 PM), https://globalnews.ca/news/3175097/nasa-plans-mission-to-a-metal-rich-asteroid-worth-quadrillions/.

would cost.[2] As technology continues to race ahead, the concept of asteroid mining is no longer limited to science fiction stories. Instead, the technology to mine an asteroid may be ready for use within the next decade.[3]

With space-mining technology becoming more realistic, the most difficult obstacle standing in the way may be the legal one. Who owns the rights to these asteroids? What level of regulation should be exercised over the mining companies, if any? What would an agreement between a governing organization operating a mine such as an international agency and a private company acting as a mining contractor look like, and what provisions would be imported from similar earthbound mining contracts?

This Note argues that the imminent space-mining race will create a new arena of contract law that will incorporate elements of contracts that govern mining in extreme earthbound environments that must also carve out new regulations and governing bodies to be effective. Part I starts with the history of outer space governance and focuses on the decades-old Outer Space Treaty and the semi-failure of the Moon Treaty, providing important context for what space-faring nations view as acceptable limits on their sovereignty and what rights may be acceded to an international agency. Further, Part I will examine the Commercial Space Launch Competitiveness Act of 2015, signed into law to provide American companies with an advantage as space mining becomes more feasible, and the recent executive order that further emphasizes that international law allows for commercial exploitation of asteroid resources. Part II briefly reviews well-established mining contracts and the common provisions that form the basis of nearly every mining contract. Part III will specifically examine the governance of mining in extreme earthbound environments, specifically in Antarctica and the deep sea. Finally, Part IV will examine potential problems space mining contracts will encounter at the outset of the industry and the likely high level of regulation and scrutiny that the contracts will receive so long as all nations agree to form and abide by a regulatory agency to avoid an interstellar gold rush that could result in the unnecessary loss of life, investments, and in damage to the interstellar "environment." The Article will conclude by discussing clauses and language which will be imported into space mining contracts from existing contracts and what language may be newly created to deal with the challenging new mining environment of outer space.

Space mining is a promising new industry in its infancy. As technology and public policy shift towards rapid development, the creation of legally binding and valid contracts poses potentially the largest obstacle impeding the development of the industry. In any new industry, contracts will inevitably rely on existing contracts in similar areas, but outer space is so starkly different than even the closest environments on Earth that the parallels that can be drawn are relatively limited. As mankind expands to the stars and begins exploiting the resources that can be found

2. *See* Asterank, http://www.asterank.com/ (last visited May 9th, 2019).

3. Thomas Heath, *Space-mining may be only a decade away. Really*., WASHINGTON POST, (Apr. 28, 2017), https://www.washingtonpost.com/business/space-mining-may-be-only-a-decade-away-really/2017/04/28/df33b31a-29ee-11e7-a616-d7c8a68c1a66_story.html. [https://web.archive.org/web/20191230095649/https://www.washingtonpost.com/business/space-mining-may-be-only-a-decade-away-really/2017/04/28/df33b31a-29ee-11e7-a616-d7c8a68c1a66_story.html].

there, the contracts law will join them. However, while the contracts will inherit aspects of earthly mining contracts, they will also have to evolve to meet the challenges that await beyond the stars.

I. SPACE LAW: CURRENT GOVERNING PRINCIPLES OF THE FINAL FRONTIER

This section analyzes the current treaties and laws governing outer space, beginning with the Outer Space Treaty signed in the 1960s and the semi-failed Moon Treaty of the 1980s. Since the advent of these international treaties, the United States has taken the next step and passed a law allowing private companies to explore interstellar mining. As the law stands now, it is unclear how private businesses may operate under the auspices of the international treaties that reserve outer space for "all mankind."

A. The Beginning of Outer Space Regulation: The Outer Space Treaty of 1967

As space exploration became a reality in the 1960s, the inevitable question of how space was to be governed became increasingly urgent. Most of the agreements of the era are still in force today with only minor changes.[4] The foundational document that governs space law is the Outer Space Treaty, ratified in 1967. Under Article I, the treaty states that "the exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind."[5]

While the Outer Space Treaty has proven resilient, that resilience is due in part to its provisions requiring state actors to govern private individual companies that operate within their borders. Article VI explains 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, and for ***assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty***. 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.[6] (Emphasis added).

The obligation placed on state governments to take responsibility for non-governmental entities operating in their jurisdiction essentially requires states to create regulations and a means to enforce those regulations themselves, or risk

4. Henry Hertzfeld, *Current and Future Issues In International Space Law*, 15 ILSA J. INT'L & COMP. L. 325, 327 (2009).

5. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies art. 1, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205.

6. *Id.* at art. VI.

violating the Outer Space Treaty.[7] Without any further guidance from the treaty, national governments therefore "have the right to adopt any form of domestic regulatory oversight as they may deem appropriate, and consistent with their national interests and policies, subject to international treaty obligations."[8]

B. National Acts Encouraging Private Companies to Expand to the Stars: The U.S. Commercial Space Launch Competitiveness Act and Executive Order

The United States passed the U.S. Commercial Space Launch Competitiveness Act in 2015 to "facilitate a pro-growth environment for the developing commercial space industry by encouraging private sector investment and creating more stable and predictable regulatory conditions, and for other purposes."[9] The Act is designed to prepare the United States, and American companies, for the advent of outer space exploitation. However, there are several aspects of the Act which seem to run counter to the international treaties to which the United States is a party. The Act, in particular, entitles private American citizens "engaged in commercial recovery of an asteroid resource or a space resource" the right "to possess, own, transport, use, and sell the asteroid resource or space resource obtained in accordance with applicable law, including the international obligations of the United States."[10] Exactly how this section accords with the Outer Space Treaty, especially Section I reserving the rights for all mankind and Section II disallowing any private ownership, is still unclear. American courts have yet to truly confront the question of outer space property rights outside of *Nemitz v. U.S.*, wherein the United States District Court of for the District of Nevada dismissed a claim by Nemitz that the United States had trespassed on his property by landing on an asteroid that he had registered as his own via a free website.[11]

On April 6, 2020, President Donald Trump signed an executive order entitled "Executive Order on Encouraging International Support for the Recovery and Use of Space Resources." The Order emphasizes that American companies will have a direct route to mineral exploitation of asteroids. Supporting private companies more strongly than ever, the Order states that

> Americans should have the right to engage in commercial exploration, recovery, and use of resources in outer space, consistent with applicable law. Outer space is a legally and physically unique domain of human activity, and the United States

7. Paul Stephen Dempsey, *National Laws Governing Commercial Space Activities: Legislation, Regulation, & Enforcement*, 36 NW. J. INT'L L. & BUS. 1, 14 (2016).

8. Leslie I. Tennen, *Towards a New Regime for Exploitation of Outer Space Mineral Resources*, 88 NEB. L. REV. 794, 802 (2010).

9. U.S. Commercial Space Launch Competitiveness Act, H.R. 2262, 114th Cong. (2015).

10. *Id.* § 51303.

11. Nemitz claimed ownership over the asteroid Eros, based on his registration on the Archimedes Institute website, which allowed anyone to claim an asteroid for free. Nemitz v. United States, No. CV-N0305099-HDM (RAM), 2005 WL 3167042 *1 (D. Nev. Apr. 26, 2004). *See* Robert Kelly, *Nemitz v. United States, a Case of First Impression: Appropriation, Private Property Rights and Space Law before the Federal Courts of the United Sates*, 30 J. Space L. 297 (2004).

> does not view it as a global commons. Accordingly, it shall be the policy of the United States to encourage international support for the public and private recovery and use of resources in outer space, consistent with applicable law.[12]

The Order then reminds readers that the United States is not a party to the Moon Agreement, stating that the U.S., via the Secretary of State "shall object to any attempt by any other state or international organization to treat the Moon Agreement as reflecting or otherwise expressing customary international law."[13] This Executive Order continues to shape American policies and goals for space mining exploitation and The Order strongly suggests the United States is willing to encourage private exploitation of space, but still takes pains to explain that the U.S. "shall take all appropriate actions to encourage international support for the public and private recovery and use of resources in outer space."[14] Just what these actions will be and whether the actions will result in international agreement remains to be seen.

As private companies contracting with the United States government begin to push outward towards the Asteroid Belt, the question of who owns the materials brought back from these missions will become increasingly important. Currently, experts are divided on how these space minerals should be treated and what impact the Act and subsequent Executive Order will have on interstellar cooperation and commercial contracts. Some academics believe that the Act and the policy that it hopes to implement is a new manifestation of the Wild West, where "he who dares wins."[15] In this case, the U.S. government is daring to allow its homegrown businesses more unfettered access to potentially the largest gold rush ever recorded while disregarding both international law and environmental concerns.[16] Alternatively, some international legal scholars maintain that the Act should not be viewed as a potentially illegal maneuver, but rather a law working comfortably within the confines of the international treaties.[17] This theory is grounded in the concept that the prohibition of ownership of outer space resources does not necessarily preclude commercial agreements and private actors, but instead only requires some form of oversight.[18] The Trump administration (and to an extent, the Obama administration) supports this theory with hopes of encouraging private American companies to get a start on the impending rush to locate the richest asteroids. There are no perfect earthbound parallels to what the governance of outer

12. Executive Order Issued by President Donald J. Trump, Executive Order on Encouraging International Support for the Recovery and Use of Space Resources, § 1 (Apr. 6, 2020) https://www.whitehouse.gov/presidential-actions/executive-order-encouraging-international-support-recovery-use-space-resources/.

13. *Id*. § 2.

14. *Id.* § 3.

15. *See* Gbenga Oduntan, *Who Own's Space? US Asteroid-Mining Act is Dangerous and Potentially Illegal,* THE CONVERSATION (Nov. 25, 2015, 6:34 AM), http://theconversation.com/who-owns-space-us-asteroid-mining-act-is-dangerous-and-potentially-illegal-51073.

16. *See Id.*

17. *See* Frans von der Dunk, *The US Space Competitiveness Act of 2015 See* Frans von der Dunk, *The US Space Competitiveness Act of 2015,* JURIST (NOV. 30, 2015, 11:52 PM), https://www.jurist.org/commentary/2015/11/frans-vonderdunk-space-launch/.

18. *Id.*

space mining will look like, but the closest analogues, Antarctic mining and deep-sea mining, will provide the best examples of how asteroid mining contracts may be regulated. This will be examined in Part III.

C. A Preview of Failure: The Moon Treaty and Lack of Interest from Space-Faring Nations

As nations and private companies turn their eyes to space mining, national laws such as the American act discussed in part B will only become more common. There may be a renewed call for international oversight of mining and interstellar ownership rights. Those interested in vesting an international space treaty with more specific enforcement mechanisms and binding states to the same rules may well wish to learn from the ambitions of the largely unratified Moon Treaty. Proposed in 1979 and entered into force in 1984, the Moon Treaty sought to cover areas of law that had been largely ignored in the Outer Space Treaty to ensure general ratification by a large number of member states.[19] One such area was the establishment in Article 11 of an international regime to oversee the exploitation of the moon and other celestial bodies for minerals and the requirement that these minerals, and the technology used to mine them, be fairly shared befitting the "common heritage" legacy of the Outer Space Treaty.[20] The major space-faring nations, specifically Russia and the United States, objected to this language. As of January 2019, only 18 countries are parties to the Outer Space Treaty, while four additional countries have signed but not yet ratified the treaty.[21]

Practically, this treaty is viewed as a failure – the signatories are, for the most part, not significant players in space exploration. Some academics argue that even if it is a practical failure in enforcing or creating new space law, the treaty is still considered valid international law.[22] If a country were to exploit a celestial body and remove minerals, the international community may complain that nation has violated international law, even if there is no remedial enforcement mechanism in place. The Moon Treaty had attempted to fill a gap in space law but failed to do so when the requirements of the treaty proved to be too restrictive for nations that had ambitions or the technology to exploit outer space.[23] Future outer space law regulation will have to consider the shortcomings of the Moon Treaty or risk becoming toothless treaties that signatories cannot enforce.

The history of international space treaties is a relatively brief one that has seen successes (the broadly construed Outer Space Treaty) and practical failures (the overambitious and limiting Moon Treaty). Marrying these existing regulations with the historical tenets of contract law is not simple. Before examining how contract law will interact with space law, Part II will review three basic areas of contract law

19. David Everett Marko, *A Kinder, Gentler Moon Treaty: A Critical Review of the Current Moon Treaty and a Proposed Alternative*, 8 J. NAT. RESOURCES & ENVTL. L. 293, 301.

20. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies art. 11, July 11, 1984, http://www.islandone.org/Treaties/BH766.html (last visited May 9, 2019).

21. Comm. On the Peaceful Uses of Outer Space, Status of International Agreements relating to activities in outer space as at 1 January 2019, A/AC.105/C.2/2019/CRP.3 (2019).

22. Michael Listner, The Space Review: The Moon Treaty: failed international law or waiting in the shadows? (Oct. 24, 2011), http://www.thespacereview.com/article/1954/1.

23. Marko, s*upra* note 19, at 308.

which will be applied to space mining: consideration, liability coverage and force majeure.

II. THE DAY THE EARTH CONTRACTED: CONTENTS OF CONVENTIONAL EARTHBOUND MINING CONTRACTS

Space mining contracts will not be created in the vacuum of outer space. Instead, parties will build these contracts out of existing contract templates that have governed earthbound mining for at least the last thirty years. Typical mining contracts may be based on a form contract that has been created by a governing entity such as the American Petroleum Institute but are often adapted to the specific purpose of the parties involved.[24] Unsurprisingly, mining contracts regulate a large range of issues between parties and often involve complicated negotiations that may significantly modify the model agreement before any minerals are actually mined.[25] While all the same areas will have to be agreed to by parties, there are particular areas of significant focus to parties planning on exploiting asteroids for their mineral value. The areas of an earthbound mining agreement that this section will focus on will play an outsized role in space mining contract negotiations, and are: (A) consideration between the contractor and mining operator that calculates the method for payment and (B) proposed protections for the parties via liability insurance and indemnification in the case of injury, environmental contamination, or force majeure. These traditional contractual issues will inevitably arise in the formation of space mining contracts as the parties agree to practical and profitable terms that reflect the circumstances of outer space mining. Examining how these issues are conventionally treated in earthbound contracts will provide a foundational understanding for how they may be negotiated and interpreted between parties in outer space. Even while exact conditions and technical requirements are still largely unknown, parties can still begin negotiating space mining contracts based on these same basic tenets that govern the typical earthly mining contract.

A. Consideration Between Mining Contractors and Mine Operators: Finding Value in the Ground

Consideration remains a vital aspect of any contract. It is "something bargained for and received by a promisor from a promisee; that which motivates a person to do something, especially to engage in a legal act."[26] In mining contracts, there exist three typical methods for calculating costs that determine the appropriate amount a contractor wishes to be paid. These are called footage, daywork and turnkey contracts.[27] A footage contract will pay the contractor based on "a stipulated price per foot of hole drilled from the surface through the total depth of the well or some other specified objective."[28] Consideration is then earned once the contractor

24. Owen L. Anderson, *The Anatomy of an Oil and Gas Drilling Contract*, 25 TULSA L. J. 177, 372 (1989).

25. *Id*. at 364.

26. *Consideration*, BLACK'S LAW DICTIONARY (10th ed. 2014**).**

27. Anderson, *supra* note 20, at 398, 399.

28. *Id.* at 398.

has completed the drilling terms in the contract.[29] Many of the footage contracts contain a daywork rate which then compensates the operator differently if something were to either shut down the operation or slow it down significantly.[30] For example, encountering a different type of rock that the operator's equipment is not adapted to handle may impede or entirely stop mining until a work-around solution can be found. When this happens, the contract would shift from a footage compensation system to a daywork system where the operator will still be paid, but under different standards that reflect a different amount of daily progress.

In contrast to a footage contract, turnkey contracts will pay operators based on reaching either a certain rock formation or a specified depth, not on a per-foot basis.[31] With a turnkey contract, the operator assumes all the risks except where limited by the contract. A turnkey contract allows for a more exploratory form of mining since discovery of a mineral does not mean that contractor is obligated to mine it out. Instead, the contractor may continue the work to completion or allow the operator to finish the job themselves. Either way can be stipulated in the contract, and completion occurs once those stipulated conditions have been met, whether it is the complete removal of the minerals or simply drilling to a specified location. Turnkey contracts also incorporate daywork stipulations if there is a delay or factor that changes how the mining may be completed.[32]

B. Protection for the Parties: Liability, Indemnification, and Force Majeure—Taking Care of Yourself When Things Go Wrong

Parties to space mining contracts will seek various forms of contractual protection in the event of injury, equipment failure, or Act of God. A well-written contract will ensure that all parties can seek some form of financial shelter in the case of the unexpected. These provisions become especially important in the mining field where, by nature, dangerous acts must be undertaken to complete the contracted duties. Model contract templates will feature clauses that include insurance coverage and what constitutes force majeure, but the parties must substantially alter these clauses to tailor them to the specific environment in which the mining will be taking place.

1. General liability protection for contracting parties

One of the most important questions to answer in creating space mining contracts will be 'who is responsible for what?'[33] A contract must make as clear as possible which party would be liable if an accident were to occur that injured someone or damaged property. With a clear contract, the need for future litigation lessens because the contract specifically dictates which party is responsible for paying out damages. Parties will agree to assume responsibility and then seek appropriate insurance coverage for the liability they have agreed to cover. This insurance will usually be written into contracts to provide parties with

29. *Id.*
30. *Id.*
31. *Id.* at 399.
32. *Id.*
33. *Id.* at 416, 417.

foreknowledge about the minimum amount of insurance they must carry to ensure a fair (or at least what the contract deems fair) payout.[34] The three types of insurance that mining contracts typically require contractors to carry are personnel insurance, automobile insurance, and general liability insurance.[35] These three basic areas of coverage are sometimes joined by property insurance to protect against loss of equipment or damage to nearby buildings.[36] Clearly, the costs of these various insurance policies and the byzantine nature of tracking certifications of up-to-date policies can be costly for contractors. To that end, some contractors will instead self-insure, meaning a certain minimum amount of money is set aside in the event of an accident.[37] Contractors will then pay out the minimum amount required from the money they have set aside and allow any insurance to cover the remaining balance, if any. Interestingly, the model contracts rarely require that operators carry any coverage even if they are assuming liability.[38]

2. Indemnification of parties

Party indemnification has spawned numerous scholarly articles examining the statutory and common law limitations of contractual clauses. In the case of mining contracts where governing law is not established by the contract, courts will often use the "most significant relationship" test to find that parties must adhere to the laws of the jurisdiction in which the services are performed, meaning where a mine is operated.[39] Certain American states limit the amount of indemnification that a party is allowed to grant based on the inherent imbalance of bargaining power between the parties.[40]

In mining contracts, risk allocation is paramount in determining who is responsible for what can be costly and high-risk ventures. Contractors will indemnify the operator from any actions by employees for injury and for any environmental claims "originating on or above the surface" and caused by substances "in possession and control of" the drilling contractor, "without regard to the negligence of any party."[41] This means the operator is not indemnified against any environmental concerns that occur below the ground which may not have been under the control of the contractor. In turn, the operator may indemnify the contractor for environmental claims not related to the actual mining operations and for claims brought by operator employees. While employee and environmental indemnification may seem to be mutually indemnified, the party with more bargaining power (and more to lose) will often request a stronger series of indemnification clauses, especially for potentially costly environmental claims to protect their interests and assets.[42]

34. *Id.*
35. *Id.* at 417,418.
36. *Id.* at 418.
37. *Id.* at 421.
38. *Id.*
39. *Id.* at 458-459.
40. *Id.* at 433.
41. *Id.* at 438.
42. *Id.* at 437.

3. Force majeure in mining contracts: Who is responsible when an Act of God occurs?

Force majeure is "an event or effect that can be neither anticipated nor controlled; especially an unexpected event that prevents someone from doing or completing something that he or she had agreed or officially planned to do."[43] In mining contracts, this almost exclusively means natural acts, such as landslides or cavern collapses. However, what exactly constitutes an Act of God is not always clear from purposefully vague language like "causes beyond the control of the party."[44] This may lead to litigation, where courts have generally strictly construed the term force majeure to an event that would truly be out of scope. For example, torrential rains that make a road impassable were not interpreted to be a flood that would fall under a force majeure clause[45] while the mere threat of a terrorist attack may not be enough to trigger a force majeure clause if there is no actual attack.[46] To this end, parties who include force majeure clauses and wish to claim damages under them generally cannot expect courts to read beyond the explicit terms included in the contract. Strangely, if a party wishes to enforce a force majeure clause and is claiming an unexpected event occurred, they would be beset advised to list that event to ensure that a court would enforce the clause.

C. Traditional Contract Clauses and Space Mining

Part IV will deal with how space mining contracts will be constructed, but this section will briefly review how these sections of traditional mining contracts will be transferred into contracts beyond the atmosphere. First, consideration between the contracting parties will probably look substantially similar to consideration seen in earthbound mining contracts, especially when turnkey calculations are used. Locating minerals that are cost-effective to mine may be an inexact science, so mine operators will likely be unwilling to pay by the foot for drilling. Instead, the mining may be more exploratory and only once the minerals have been located will the mine operator then contract with another party to extract the minerals. There will be extensive efforts at creating protections for both parties considering the extreme environment and unknown environmental impact that drilling on asteroids may have. Insurance companies, at the outset of this new industry, may be unwilling to cover missions to asteroids, so there may be more self-funded insurance created by contractors and operators. Both contractors and operators will seek indemnification from liability for injured employees because the risk is even higher than the most dangerous environments on earth. Just how dangerous is currently unknown, as is what would exactly constitute force majeure on an asteroid. It may be difficult to write a specific force majeure provision that a court would be willing to enforce if the contracting parties are not able to imagine what unknown events may occur on an asteroid. The only possible mining parallels on earth would be the Antarctic and the ocean floor, the two most extreme environments where mining contracts have

43. *Force Majeure*, BLACK'S LAW DICTIONARY (11th ed. 2019)

44. Anderson, *supra* note 20 at 458.

45. *See Logan v. Blaxton*, 71 So. 2d 675 (La. Ct. App. 1954).

46. Janice M. Ryan, *Understanding Force Majeure Clauses,* VENABLE LLP (Feb. 11) https://www.venable.com/insights/publications/2011/02/understanding-force-majeure-clauses.

been negotiated. The next section will examine how mining has developed in these areas, including international governmental oversight and its large impact on how mining contracts are created.

III. MINING CONTRACTS IN EARTH'S FINAL FRONTIERS: THE DEEP SEAS AND THE ARCTIC

Mining has seen a sharp decrease in fatalities in recent years,[47] but the profession has been consistently listed as one of the most dangerous occupations.[48] This is due, in part, to the remote locations of many mines containing a variety of in-demand minerals, precluding the need to mine multiple times at less extreme locations for the same amount of return.[49] As the demand for a number of minerals remains high, mining will become more dependent on far-flung locations that can provide the most effective return. A proliferation of mines in areas that are not under one nation's jurisdiction has led to questions about access and about the fair creation of contracts for private parties in these areas. The Artic proved to be so complicated that a moratorium on mining was put in place until 2048, while deep sea mining is regulated largely by international bodies, with nation-state members of these bodies sponsoring private companies originating from their jurisdiction. This part examines how these contracts are created, what essential elements are included for mining in extreme environments that are under international jurisdiction, and which of these elements may translate to asteroid mining contracts.

A. Antarctic Mining Was Strictly Prohibited Before the Technology Became Available to Properly Exploit the Continent's Mineral Wealth

In 1959, the first nations signed onto the Protocol on Environmental Protection to the Antarctic Treaty ("PEPAT"), "recognizing that it is in the interest of all mankind that Antarctica shall continue forever to be used exclusively for peaceful purposes and shall not become the scene or object of international discord; Acknowledging the substantial contributions to scientific knowledge resulting from international cooperation in scientific investigation in Antarctica."[50] The initial protocol did not contemplate mining for fear of lack of support, but the issue of commercial exploitation increasingly became a pressing issue for the nations that had already established a presence on the continent.[51]

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47. U.S. DEP'T OF LABOR, METAL/NONMETAL FATALITIES FOR 1900 THROUGH 2019 (2019).

48. *Infographic: America's Most Dangerous Jobs*, MINING [DOT] COM (Apr. 29, 2015, 10:29 AM), http://www.mining.com/web/infographic-americas-most-dangerous-jobs-2/.

49. *Mining the Deep Ocean Will Soon Begin*, THE ECONOMIST (Nov. 8, 2018) https://www.economist.com/science-and-technology/2018/11/08/mining-the-deep-ocean-will-soon-begin.

50. The Antarctic Treaty, December 1st, 1959, at 1. Available at https://www.ats.aq/e/antarctictreaty.html. (last visited May 6, 2020). *See also* Sean Coburn, *Eyeing 2048: Antarctic Treaty System's Mining Ban*, 42:2 COLUM. J. ENVTL. L. (2017) (providing a more general background on the history of the protocols); *See* Sean Coburn, *Eyeing 2048: Antarctic Treaty System's Mining Ban*, 42:2 Colum. J. Envtl. L. at 6 (2017).

51. *See* Sean Coburn, *Eyeing 2048: Antarctic Treaty System's Mining Ban*, 42:2 COLUM. J. ENVTL. L. at 6 (2017).

In 1991, the Madrid Protocols were signed in response to this pressing question, effectively banning any mining or other commercial enterprise[52] until 2048 by requiring a binding legal agreement that determines whether any mining activities would be acceptable.[53] Interestingly, the Protocols include a "walkout clause" which allows a member to withdraw from the agreement if an agreed-upon modification does not subsequently enter into force.[54] Additionally, the Protocols do not have any mechanism that gives any power to punish a nation that breaks with the other nations and unilaterally begins drilling.[55] Consequently, the Protocols are reliant on the good faith of the signatory nations.[56] The Protocols import the same spirit espoused in the Outer Space Treaty, acknowledging that "the protection of the Antarctic environment and dependent and associated ecosystems is in the interest of mankind as a whole."[57] Whether this will be enough to convince all member nations to remain complaint with the Protocols in the face of increasingly accessible mineral resources and a lack of any cognizable liability outside of a potential international outcry remains to be seen.[58]

B. Deep Sea Mining by Private Contractors is Sponsored by Nations That Abide by International Agreements and Procedures

While Antarctic mining is essentially prohibited until 2048, deep sea mining is under no such moratorium. Instead, deep sea mining is a growing commercial business, albeit one that is carefully overseen by sponsoring nations, and even then, is limited to only a small number of countries. Even more than technology for Antarctic mining, technology to successfully and profitably mine in the deep seas has only recently become feasible, to the extent that the rules governing the mining itself are still being formulated.[59]

With the technology now available to exploit the ocean bottom, the question of which governing body would oversee international waters becomes more important. The governing treaty for international waters is the United Nations Convention on the Law of the Sea ("UNCLOS").[60] Entering into force in 1994, UNCLOS imports the same language used in other international governing instruments, stating that the international seabed and its mineral resources are "the common heritage of mankind" and that mining operations and other activities there should be conducted "for the benefit of mankind as a whole."[61] Unlike Antarctica, deep sea mining has been a part of the international agreements for the management of the seabed since the treaty's inception.

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52. Protocol on Environmental Protection to the Antarctic Treaty Art. 7, 1991. Available at https://documents.ats.aq/recatt/Att006_e.pdf. (last visited August 15, 2020).

53. *Id.* at Art. 25.

54. *Id.*

55. Coburn, *supra* note 51, at 3.

56. *See Id.*

57. Protocols *supra* note 53, at preamble.

58. See Coburn, *supra* note 51.

59. THE PEW CHARITABLE TRUSTS, DEEP-SEA MINING: THE BASICS 1 (factsheet updated June 6, 2018), https://www.pewtrusts.org/-/media/assets/2018/07/deep-seabed-mining-basics_18-06-v3.pdf.

60. *Id.*

61. United Nations Convention on the Law of the Sea, Preamble, Dec. 10, 1982, 1833 U.N.T.S. 3.

UNCLOS identifies the seabed beyond coastal waters as "The Area," and designates the International Seabed Authority ("ISA") as the primary organization that oversees the management and regulations of mining in The Area.[62] The ISA is made up of member-states who create the standards that must be met for a private contractor to begin mining. Member-states may sponsor a private company or other enterprise that is based in their jurisdiction. This sponsorship would then allow that private company to become eligible for an ISA contract and to operate in the Area.[63] Only then, after the company's proposal has been recommended for approval by the International Seabed Authority's Legal and Technical Commission and then approved by the ISA Commission, may the company proceed with the exploratory phase of mining the seabed.[64] To get this approval, the company (or entity) must satisfy a number of rigorous requirements ranging from ensuring environmental protection to proper collection of data.[65] Even then, the company is limited both in time and scope. The company will often receive a long-term sponsorship for 15 years, with a renewable option included as well as a specified area to explore and mine, and must focus on a specific "nodule" known to contain a specific mineral.[66] Finally, even after being approved for exploratory mining, the private company must conform to the Mining Code, which is maintained by the ISA and is still under development.[67] The Mining Code, as it currently exists, is fully available online and provides not only regulations and rules, but also the forms required for private companies to apply for a contract and the standard terms that are typically included in a deep sea mining contract.[68]

The typical mining contract includes provisions such as an annual overhead charge of $47,000 that the contractor must pay to cover the ISA's administrative and supervisory costs,[69] a required "precautionary approach" when dealing with fragile

62. THE PEW CHARITABLE TRUSTS, DEEP-SEA MINING: THE BASICS 1, *supra* note 60.

63. United Nations Convention on the Law of the Sea, *supra* note 62, at Article 153.

64. INTERNATIONAL SEABED AUTHORITY, Seabed Council Approves Seven Plans of Work, Brazil Submits Proposal On Extension of Exploratory Contracts, https://www.isa.org.jm/news/seabed-council-approves-seven-plans-work-brazil-submits-proposal-extension-exploratory (last visited Apr. 14, 2020). (explaining that the requirements for the different minerals are all the same, "[t]he procedure for consideration by the Legal and Technical Commission of applications for plans of work for exploration in the Area are identical in the regulations covering each mineral. In considering a proposed plan of work for exploration, the Commission is required to take into account the principles, policies and objectives relating to activities in the Area as provided for in Part XI and annex III of the United Nations Convention on the Law of the Sea and the 1994 Agreement on the Implementation of Part XI (seabed mining provisions) of the Convention.")

65. *See generally* International Seabed Authority, Decision of the Assembly of the International Seabed Authority Relating to the Regulations on Prospecting and Exploration for Polymetallic Sulphides in the Area, 16/A/12/Rev. 1, at Part III (May 7, 2010).

66. *Id.* at reg. 20.

67. *Id.* at reg. 27.

68. International Seabed Authority, The Mining Code, https://www.isa.org.jm/mining-code (last visited May 9, 2019).

69. International Seabed Authority, Decision of the Assembly of the International Seabed Authority Concerning Overhead Charges for the Administration and Supervision of the Exploration Contracts, 1, 19/A/12 (July 25, 2013).

marine environments,[70] the specific allocation of The Area that a contractor may mine,[71] requirements for reports,[72] training,[73] duration, and much more.[74] Even with all these requirements and procedures, there are currently 29 contractors actively performing exploratory seabed mining, sponsored by countries like Brazil, China, Cook Islands, India, Poland, and Tonga.[75] These contractors are incorporated in the member-states that sponsor them, so it seems that if a nation were to deny sponsorship or the member-states deny the contract, then the company would have to reform in another country and seek approval from that member-country.

American membership represents a significant difference between the Antarctic Madrid Protocols and the International Seabed Authority. The U.S. has not signed UNCLOS and is therefore not a member of ISA, but still often sends delegates to ISA meetings to stay abreast of new regulations approved by the body.[76] The U.S. has focused mining efforts on its own coastal waters, which does not require any oversight from an international regulatory body.[77] The U.S. has not signed UNCLOS or the 1994 modification that governs seabed mining, in part due to conservative opponents who argue that ratifying the treaty would provide no benefits that the United States does not already enjoy, and dependence on the power of the United Stated Navy is a better solution to defending those benefits.[78]

With such heavily monitored mining oversight over the most extreme and fragile environments on earth, certain parallels can be drawn to outer space governance. Space law has not yet reached the same level of specificity to focus on mining in particular, but has instead remained broadly protective of all incursions made beyond the atmosphere. Part IV traces the development of space law and the current principles that regulate interactions with outer space.

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70. International Seabed Authority, Decision of the Assembly of the International Seabed Authority Relating to the Regulations on Prospecting and Exploration for Cobalt-rich Ferromanganese Crusts in the Area, reg. 5, 18/A/11 (October 22, 2012).

71. *Id.* at Annex III ¶ 2.

72. *Id.*§ 10.

73. *Id.*

74. *Id.* (The entirety of the 49-page regulation governs the three different types of mineral exploration, with all three being generally identical: Cobalt-rich Ferromanganese Crusts, Polymetallic Sulphides, and Polymetallic Nodules.)

75. Deep Seabed Minerals Contractors, International Seabed Authority, https://www.isa.org.jm/deep-seabed-minerals-contractors (last visited May 9, 2019).

76. A High-Stakes Week for Deep-Sea Mining, OCEANS, https://www.newsdeeply.com/oceans/articles/2018/07/16/a-high-stakes-week-for-deep-sea-mining (last visited May 9, 2019).

77. Kathryn A. Miller et al., *An Overview of Seabed Mining Including the Current State of Development, Environmental Impacts, and Knowledge Gaps*, 4 FRONT. MAR. SCI. (2018), https://www.frontiersin.org/articles/10.3389/fmars.2017.00418/full (last visited May 9, 2019).

78. Theodore R. Bromund, 7 Reasons U.S. Should Not Ratify UN Convention on the Law of the Sea, THE HERITAGE FOUNDATION, /global-politics/commentary/7-reasons-us-should-not-ratify-un-convention-the-law-the-sea (last visited May 9, 2019).

IV. OUTER SPACE LAW AND CONTRACTS LAW: COMBINING TWO DISPARATE DOCTRINES TO ENABLE MINERAL EXPLOITATION AND PRESERVE THE HEAVENS FOR ALL MANKIND

Contracts created for emerging industries are not created in a vacuum. Asteroid mining is at the same historical point where Antarctic and deep-sea mining were when the existing international agreements were ratified. Mining is quickly becoming technologically and financially feasible, but governing entities and general contracting language are not yet fully established. As standard asteroid mining contract language is created out of existing earthbound contracts, parties will begin by patterning agreements on existing language from the agreements made between parties mining in extreme earthbound environments. As asteroid mining inches closer to becoming a reality, finding the strongest parallels in both the Madrid Protocols and even more so in the International Seabed Authority's Mining Code is a logical starting point for mining contractors.

The Outer Space Treaty has been in effect for over 50 years. Despite this well-established governance, there remains uncertainty for how outer space exploration and exploitation will functionally operate, especially in light of the practical failure of the Moon Treaty in governing exploitation of celestial bodies. With international law remaining static, individual nations have been tasked with developing laws that conform to decades-old treaties. These new laws are focusing less on exploration and weaponization of space, instead attempting to govern who may own resources they have contracted for. Basic mining contracts allow for agreements between the mining company and the owners of the property. The Outer Space Treaty stipulates space as belonging to all mankind but remains vague about whether resources removed from outer space can be contractually mined. The marriage of these two seemingly disparate areas of law must occur if the fledgling industry of asteroid mining is to flourish. This final part will examine the possibilities of creating contractual instruments that can coexist within the existing international treaties, but only to the extent that participating nations are willing to agree to oversight by an international adjudicatory body governing mining. If nations, particularly the United States, are unwilling to surrender some form of sovereignty to a governing body similar to the ISA, then asteroid mining may more closely resemble a "gold rush" where companies are free to claim the richest asteroids regardless of which nations have previously claimed mining territory. This could create great risk to not only technological investments, but also human lives, as this new frontier is explored and exploited.

A. Contract Law Will Form an Important Part of Outer Space Law, But the Form That it Will Take Depends on International Agreement—Or the Lack Thereof

Mining contracts and their basic tenets can be imported into contracts executed for outer space industry. Asteroid mining contracts cannot be extrapolated directly from any existing contract due to the still unknown technical requirements of mining in space and the clear differences in environment. However, the Outer Space Treaty, Madrid Protocols and UNCLOS all share a common foundational belief that the areas each governs is to be exploited so as to "benefit all of

mankind."[79] Regardless, this high-minded principle has not blocked mining in the deep sea, nor will it in the Antarctic once the mining moratorium expires. If governing bodies were to rely solely on the operational and seemingly aspirational language that outer space and all its resources are reserved for the benefit of all mankind, then the treaty would fail as nations move to create laws that allow for exploitation.[80]

Instead, there are two possible contractual precedents that could be developed from existing Antarctic mining or deep-sea mining. First, the Outer Space Treaty could form the basis for a moratorium on asteroid mining until the full implications of mining in space are more fully understood. Similar to Antarctica and the Madrid Protocols, space-faring nations may hesitate to unleash a race to exploit the asteroid belt without more regulations in place that limit the unknown environmental effect of interstellar mining. However, there does not appear to be any international interest in putting a freeze on asteroid mining. Instead, the United States has signed into law the means for private American companies to begin the complicated and dangerous work of mining the asteroids. Applying traditional property rights to outer space could ignite a new space race where companies, in cooperation with their nation's government, claim asteroids as their own and exclude others from their property.[81] A property-oriented approach to mining rights loses the clarity that contracts between governments and private corporations provides. Without the protection of contracts, a private company may not be able to exercise property rights over their mined resources, and even then, their property rights could depend entirely on the company's chosen method of extraction.[82]

Instead of relying on traditional property claims, asteroid mining will likely adapt the contractual language that has been established for deep sea mining, incorporating common clauses found in existing mining contracts. The International Seabed Authority's Mining Code provides a template from which a similar organization, working under the Outer Space Treaty, could begin to institute its own code that regulates companies interested in asteroid mining. The Mining Code can establish the duration of mining contracts, specified areas of the seabed, the minerals that can be extracted, and the restrictions under which the company can operate, such as the promise to not disturb any fragile environments. Drawing parallels between these contractual stipulations and contracts for asteroid mining is simple. For example, exploratory mining could be limited to a certain number of years, though the duration may be longer than that of deep-sea mining to account for the cost and distance involved in working on asteroids. Additionally, instead of defining an "Area" of the seabed, any particular asteroid that contains a known mineral could be selected for each individual contract or series of contracts for one company. Finally, some form of environmental protection may be added to the contract, which may

79. David Sarnacki, *Property Rights in Space: Asteroid Mining Student Articles Edition*, 2 TEX. A&M J. PROP. L. 123–146 (2014).

80. 25 November 2015 - President Obama Signs the SPACE Act Into Law, APES IN SPACE, https://apesinspace.co/blogs/space-history/25-november-2015-obama-space-act (last visited May 9, 2019).

81. Sarnacki, *supra* note 79.

82. *Id.*

protect against unknown effects of mining, either on the asteroid itself or from bringing the mined resources back to Earth.

These parallels seem to work neatly, but there are significant challenges to enacting contracts that resemble deep sea mining in space. First, the wealth available to private companies and nation-states through asteroid mining dwarfs the mineral riches of the sea floor. Companies who have the technology available to exploit this wealth will be reluctant to accede to any oversight they see as either overly detrimental to their own personal interests (like the Moon Treaty's limitations on exploitation) or unnecessary (possibly requiring sponsorship from a member-nation of an international organization), and may instead flout a treaty that limits their ability to take advantage of the minerals available to them.

Second, even if the majority of nations agree to an international governing body, the reluctance of even one major interstellar player may prove fatal. The Moon Treaty is again an example of a treaty that would provide a roadmap for how mining may be contracted, but without the agreement of the world's space powers, there is little power in it—beyond a shadow of threat—to object to a nation's practices. UNCLOS provides another example. The United States has not agreed to international oversight, in part because there is enough U.S. territory near deep sea mining sites that it need not agree to international seabed mining. That will not be the case in outer space, where nations may not claim any territory as their own under the Outer Space Treaty. For an international agreement concerning space mining to come into power with force, all the major powers will have to agree. For this to occur, the agreement must include language that allows private companies to exploit minerals in line with the American act passed in 2015.

Despite American reluctance to grant any oversight to an international body in similar situations, the best route forward to ensure safer exploitation is the creation of an international regime that creates a mining code for asteroids. This agreement could largely mirror the UNCLOS agreement, but with an overarching dedication to the Outer Space Treaty. The Outer Space Treaty serves as an excellent starting point since it not only already counts all major nations as signatories, but also allows for broad interpretations of areas such as mining exploitation that stand a better chance of receiving approval from private companies and governments wishing to encourage and spur private commercial growth among the stars. From there, a regulatory oversight committee could track the thousands of asteroids and which companies have landed on each. It could then also track environmental accidents, assist with cleanup, serve as an arbitrator for disputes between companies or between nations, and perhaps even assist with rescue operations if lives are in danger. The agency, if granted enough power, could also assume responsibility of assigning certain asteroids to member-states who would then delegate those asteroids to private companies, similar to UNCLOS. It is unlikely that the United States and other interstellar powers such as China or Russia would agree to this aspect and would instead limit the power of the agency to more administrative duties. As space mining becomes safer and technology continues to advance, any agency-imposed regulations will be easier to meet and contractual terms can loosen. The agency may even transfer some of its oversight power to nations or to the companies themselves as technology improves and strict human oversight becomes less necessary.

Those opposing any oversight of asteroid mining may argue that even a small agency such as the one proposed above will inhibit the free market and encourage companies to act discreetly in finding asteroids to mine, especially with so many asteroids available. However, there is simply not yet enough known about space mining to ensure that these private companies are not causing either irreparable damage or unnecessarily risking lives and investments. However, so long as the international agency and treaty created to govern space mining does not restrict the ability of nations and private companies to claim materials that they have exploited, the treaty can be beneficial not just for private companies, but also "for all mankind."

B. Creating the Contractual Final Frontier: Incorporating Earthbound Contractual Language into Space Mining Contracts

Assuming the existence of international oversight that allows for private company access via national legislation, contracts must be created that satisfy both the contracting private party and the mine operator, which may be either the member-state that oversees operations on a particular asteroid or the governing agency itself. Returning to the three primary areas of contract law examined earlier in this Note, the contracts will include clauses that govern consideration, liability insurance, and indemnification.

1. Consideration on an asteroid: speculation as calculation, scaled by risk and reward

Contractors mining asteroids will require compensation – most likely more than what an average earthbound contractor could demand. A well-drafted space mining contract will provide for compensation based on the expectations of both the operator of the mine and the contractor. As the industry begins to develop, this will mean that consideration will not be determined using footage calculations at the outset since the location of minerals may still be in doubt when asteroids are first mined. Instead, the use of turnkey consideration is more likely, allowing for the parties to contract for more exploratory mining that fulfills consideration requirements based either on a particular depth of mining or reaching a certain rock formation underground. With so many unknowns, daywork clauses must also be included. Stoppages and slowdowns will inevitably occur as asteroids are examined for minerals and challenging obstacles are encountered. For example, if an asteroid mine operator wants to determine where iron is located under the surface, they may contract with a contractor to first dig for 1,000 feet at a consistent rate of advancement offset by a predetermined daily payment for unexpected stoppages or complications. The operator may limit the depth because the cost to operate the mine may become financially prohibitive beyond a certain depth, while the contract may still expect compensation if something unexpectedly slows progress. Turnkey calculations, with daywork rates included, provide less structured consideration requirements that give operators more freedom to discover deposits of minerals while still ensuring fair compensation for the contractors – the preferable way to construct consideration when mining commences on an unknown asteroid.

2. Space insurance: inventing new liability insurance to protect companies from lawsuits

Mining contracts will inevitably include liability protections – mining can be a dangerous and costly occupation, and entering into a contract without protection would be foolish. Mining in space will only be more dangerous than standard mining endeavors, especially at the outset. Contractors will certainly carry personnel and liability insurance, as well as property insurance to guarantee that their costly equipment is not a total loss if an accident were to happen. What is unclear is whether automobile insurance will translate to interstellar vehicles – would State Farm insure a space rover on an asteroid, and if so, how would the value of these vehicles be calculated?[83] The Commercial Space Launch Act requires that the federal government backstop private insurance coverage with a safety net of 1.5 billion dollars.[84] It remains unclear if this pot of federally-supported coverage would translate to private companies operating on asteroids. What may be most likely is the rise of space-bound insurance that provides higher coverage but at higher rates. A mining contractor would be required to carry a certain amount of this private "space-faring" insurance while also applying for additional necessary coverage from an existing federal fund. If nations are involved as mining operators it becomes increasingly likely that the federal funds would be available as an insurance option since the nation-operators would not wish to contract with a contractor that is not properly covered and cannot seek proper coverage from private insurance companies.[85]

Environmental damages and costs are an especially prominent unknown factor in space mining. If an accident occurs that spills minerals across an asteroid or into space, who would be liable and to what extent? The environmental equivalent of an oil spill on an asteroid cannot yet be imagined. Perhaps there is not even an environment that can be damaged on an asteroid. It is more likely that some form of coverage will be required in the case of an environmental disaster. Even if the asteroid itself is not damaged by an environmental accident, there remains the possibility that an accident could make the mine inaccessible or dangerous. Space mining contracts will include some form of liability coverage that assigns responsibility for environmental harm, even if that harm may not yet be known, because it is better to be certain that a particular party is responsible for the harm than to assume that there will be no environmental impact at all. Overall, liability agreements between parties will be imported into space mining contracts on a larger scale than ever seen before. Both sides will seek to protect their own investments against lawsuits, both from known sources (such as personnel injuries or fatalities)

83. Nick Stockton, *Yup, Rockets Need Insurance, Too. But Way More Than the Feds Think*, WIRED, Mar. 2017, https://www.wired.com/2017/03/yup-rockets-need-insurance-way-feds-think/ (last visited May 10, 2019).

84. *Id.*

85. Lalin Kovudhikrulrungsri & Duangden Nakseeharach, *Liability Regime of International Space Law: Some Lessons from International Nuclear Law Outer Space Development and International Law*, 4 J. E. ASIA & INT'L L. 306, 307 (2011). (This insurance may no longer be enough to ensure proper protection for space exploration, let along space mining.)

There have been suggestions that space insurance resemble nuclear law insurance where modified civil liability is common. *Id*. at 316.

and unknown sources (such as damage to asteroid environments). Only once the unknown aspects of space mining are removed and the mining itself becomes more established will insurance agreements in space mining contracts begin to resemble the more typical contracts of earth.

3. Acts of god in outer space: when a party is not liable in outer space

The final portion of this section considers what constitutes an Act of God in outer space. Force majeure absolves parties of liabilities and indemnifies them against responsibility in the case of an unexpected act that was beyond their control. Drawing parallels between unexpected acts on earth and in space can stumble into the realm of the fantastic, as guesses of asteroid showers, gas explosions, and other cosmic phenomena make it onto the list of predictions for what may be defined as an Act of God in space. Space law has previously held that force majeure is not an exception to liability, deeming it too strong of a deviation from the primary goal of assigning liability to contracting parties.[86] This designation applied primarily when the only parties contracting were nations, so a private company could disallow a force majeure exemption from liability, but contractors should ask that such a clause be included. Even a vaguely worded clause that exempts parties from any Act of God that "includes but is not limited to . . ." language could lead to precedent setting litigation that would resolve the question of whether force majeure is a doctrine that will be recognized by courts as binding on parties contracting to mine in outer space. If high courts determine that force majeure is appropriate for space mining contracts, parties will better understand what exactly constitutes an Act of God once mankind has "slipped the surly bonds of earth."[87]

4. Contractual clauses from the earth to the moon and beyond

Space mining contracts must tackle problems that exist in both space law and in mining law. Both parties to the contract negotiate for proper consideration based on the amount of mining that must be completed, but this consideration can be calculated several different ways. In space, a more exploratory turnkey consideration is appropriate as asteroids represent the ultimate potential in unknown quantities which will limit the need of mine operators to require exact drilling depths from contractors. As mining contractors begin to send equipment and people to far-flung celestial bodies, new forms of costly insurance must be created to ensure protection against loss of life, equipment, and investments. As discussed above, the more involved national governments are in the process, the more likely they are to support insurance companies providing coverage for expensive and dangerous mining missions. Finally, the liability of parties may be further extended by a lack of force majeure in outer space. Even if force majeure is included in a contract, litigation will likely result since there is no clear understanding of what constitutes an Act of God in outer space. As space mining contracts are created, these important and traditional contractual clauses should be considered, adapted and entered into any well-drafted contract. Both parties are more likely to benefit from a turnkey contract that includes

86. *Id*. at 291, 301.

87. John Gillespie Magee, *The complete works of John Magee, the Pilot Poet 79 (1989)*.

proper space-faring insurance coverage and an exemption for force majeure accidents.

V. CONCLUSION

In the vacuum of space, nobody can hear you scream, but a contract can still speak volumes. Asteroid mining represents an amazing opportunity to create a vibrant new industry that will introduce a competitive job-making market and literally new worlds of minerals ready for exploitation and earthly use. The technology is nearly ready and private companies are already exploring the possibility of interstellar mining and the absurd amounts of profit that can be made. The legal questions may be the biggest hurdles remaining to making space mining a reality. This Note argues that, initially, the best way to proceed is with an international agency overseeing private companies to ensure that proper procedures are followed and to address any unnecessary injuries or losses that may result from an unregulated "gold rush" environment. As space mining stabilizes, regulation can slowly pass from the oversight committee to the member-states of the international agency or to the private companies themselves. This cautious approach allows the industry to grow safely and expand into the heavens in a productive but safe manner similar to the seabed mining that takes place on Earth. Well-drafted space mining contracts will encompass clauses that include turnkey consideration, space-faring insurance, and a force majeure clause that tries to define qualifying events in outer space. This plan provides a fair amount of oversight and protection for parties both contractually and in the physical world. As humankind moves beyond the Earth, contract law must be adapted to new challenges and new worlds beyond our own.