XXVII
TECMUN Jr.

United Nations Office for Outer Space Affairs

"The human adventure is just beginning."

Gene Roddenberry

Dear Delegate,

We live in an exciting era of scientific progress. The thrilling promise of human settlement on a different planet and the boundless possibilities of asteroid prospecting are just two of the countless ventures that mankind can achieve over the next few decades if it chooses to continue down the path of progress that it has followed for many years—albeit one that has gradually slowed down since the ending of the Space Race. However, despite the wonders that current extraterrestrial endeavors hold, there is still much to do in order to ensure that our galaxy is being researched in a truly peaceful, inclusive and sustainable fashion.

The exploration of outer space is the ultimate test for international relations. There would be no point in trying to conquer foreign planets when mankind can barely survive on the planet it is native to. Peace and cooperation on Earth must certainly be achieved in the first place if humanity ever expects to live in harmony on a completely alien planet. Before we prove we are capable enough to not be physically restrained on the planet that we were born in, we must prove we are also capable enough to cooperate with others and put aside any differences we may have. And that is why international organizations—such as the United Nations—play such an important role in the current and future exploration of our cosmos.

There is no limit to what humanity can achieve when it puts its mind to something. When it puts its mind to resentment and hostility, uncontrolled hatred can entirely ravage the world, the way it has previously done so many times. But when humanity puts its mind to cooperation, exciting breakthroughs and inspiring progress can be reached by any group of people that is willing enough to make its dreams come true. Your mission in this committee, dear delegate, is to make sure that mankind's unbounded potential is used for good—for the benefit of all people, in all nations on Earth. Your ideas are needed to ensure an ideal future outside of our home planet.

Please, do not be afraid to voice your opinion, dear delegate.

Shoot for the stars.

Dante Uriel Pineda Cortés
President of the United Nations Office for Outer Space Affairs
XXVII TECMUN Jr.

Background of the United Nations Office for Outer Space Affairs

Formed in 1958 as a specialized unit in charge of assisting the recently created Committee on the Peaceful Uses of Outer Space (COPUOS), the United Nations Office for Outer Space Affairs is a division of the United Nations Secretariat. It is tasked with implementing the decisions made by the General Assembly and the aforementioned COPUOS relating to the promotion of international cooperation for the peaceful exploration and employment of outer space. Headquartered in Vienna and conformed by 92 member states, UNOOSA has the abilities to review existing legal frameworks regarding space activities, assist with the creation of new ones, and provide practical support on the use of space technology via workshops, initiatives, fellowships, and the establishment of regional centers.

Topic A

Promotion for the involvement of countries with lesser technological capacities in the ongoing exploration of Mars

By: Dante Uriel Pineda Cortés

Introduction

Ever since the landing of the Viking probes in the year 1976, Mars has only ever been explored by four different space agencies: the United States' National Aeronautics and Space Administration (NASA), the Soviet Union's Space Program (CCCP), the Indian Space Research Organization (ISRO), and the European Space Agency (ESA). While the amount of information that the scientific community counts with when it comes to this planet has vastly increased over the last few decades, Mars still remains as largely uncharted territory. It is yet to be explored by a wider variety of nations which might provide humanity with further, more diverse insight into different aspects of the red planet.

In the present day, the rapid development of technological and scientific conditions allow more for a manned mission to the red planet each time. Research for space travel remains a field that various developed countries are still active in, and public interest in the matter—while significantly decreased—has not fully died out since the end of the Space Race in the late twentieth century. Even though certainly not as active as it was at the height of the Cold War, the aim towards the exploration of outer space has had a resurgence in the twenty-first century, especially when it comes to the objective of having human beings reach Mars—a goal which would seem to have been set by humanity as soon as the moon was reached.

There is a substantial amount of future missions that are programmed to the planet as of today, and progress continues to be made by developed nations when it comes to the technology for its exploration. However, government spending for space exploration has notably diminished in developing nations. Despite the astonishing achievement that a landing on Mars would signify—not just for a single country, but for mankind as a whole—few developing nations continue to support government-funded space agencies. Almost none count with the necessary economic resources for the establishment of privately funded organizations that aim for the same goals.

Though the expansion of space research for other purposes might be at the center stage for developing nations, it is impossible to deny the grand opportunity that the planning and development of technology for interplanetary exploration signifies for any country to showcase its scientific capacities. As such, it is only through international cooperation and support among the various countries of the world that proposals for the participation of developing countries in the exploration of Mars may be reached—an especially important aspect if mankind desires its first landing on a whole different planet to truly represent the technological and scientific potential of the entire international community.

An observational history of Mars

Mankind's fascination with Earth's closest neighboring planet began when the earliest ancient civilizations first observed and attempted to analyze an unusually bright dot in the firmament. Upon discovering that this celestial object was more distant than the moon and had a motion cycle different than that of most stars, early astronomers concluded they were observing a whole different planet. Named Mars after the Roman god of warfare, this planet was first studied scientifically in the late sixteenth century by Tycho Brahe, a Danish astronomer who was the first person to make calculations of its position in relation to Earth. In the year 1609, Galileo Galilei was the first person to observe the planet with a telescope. As the seventeenth century continued, technological advances—namely, the rapid improvement of the telescope—allowed for a more in-depth look at the planet. European astronomers such as Giovanni Cassini and Giovanni Schiaparelli were among the first to study the planet up close, making observations about its geography, its geology, and its motion around the cosmos.

As the years went on, mankind's knowledge of Mars expanded further than the knowledge of any other foreign planet. The planet was divided into two regions: Maria, the dark regions, and desert, the light regions. A misinterpreted landscape feature discovered by Schiaparelli led to the popular belief of there being canals on the planet, which could act as signs of intelligent life. However, this myth was soon denied by the scientific community. Deimos and Phobos, Mars' moons, were discovered in 1877 by American astronomer Asaph Hall.

Observational studies of Mars from Earth continued well into the twentieth century. In the year 1947, the Association of Lunar and Planetary Observers (ALPO) was formed. It became one of the most prominent programs in the field of research of the red planet given the active collaboration among its members from different countries around the world. In

1952, modern equipment allowed for the discovery of carbon dioxide in the Martian atmosphere and the calculation of its approximate atmospheric pressure. By the time of the creation of the American National Aeronautics and Space Administration in the year 1958, different sources counted with sufficient information to allow for a mission to the red planet to be undertaken.

An explorational history of Mars

With the beginning of the Space Race in the second half of the nineteen fifties, the two global superpowers—the United States of America and the Union of Soviet Socialist Republics—began developing technology for the further observation and exploration of outer space at an unprecedented rate. Ever since before the objective of getting a human being to outer space was met in 1961, both nations had begun to aim for the more ambitious goal of reaching an entirely different celestial body. While more effort was put into missions to the moon, the Soviet Union soon began developing the first plans for launching spacecraft to the Martian atmosphere as well. On October 10th, 1960, Marsnik 1, the first ever spacecraft designed with the intent of carrying out a flyby of Mars, was launched by the Soviet Union. The probe was destroyed before it had even reached the Earth's orbit. The Soviet Union continued to send unsuccessful spacecrafts, and the United States soon followed suit by launching the Mariner 3 probe on November 5th, 1964. This first American mission also failed, however, when the spacecraft's solar powers went offline and its batteries died a few hours after its initial launch.

The first successful flyby of Mars did not take place until the year 1965, when NASA's Mariner 4 probe, launched seven months earlier, made it to the planet's atmosphere and was able to send pictures of its surface back to Earth. Soon enough, two more probes were launched by the United States—Mariner 6 and Mariner 7—providing the scientific community with plenty of new information about the planet and the very first pictures of it from up close. Afterwards, Mariner 9 was launched. Active between the years 1971 and 1972, it took a large number of pictures of the planet which allowed for the discovery of dormant volcanoes and huge canyons on its surface. As such, these first missions allowed for the further study and a more in-depth analysis of Mars. What followed were several attempts carried out by the Soviet Union as they tried to reach the red planet as well. Many unsuccessful missions took place between 1969 and 1974, and the Soviet Union was never fully able to reach and analyze the planet in the way the United States did.

The first successful landing of a spacecraft on Mars took place on July 20th, 1976, when NASA’s Viking 1 lander made it to the planet’s surface four days after an orbit adjustment. Safely nestled on the Chryse Planitia, this first device to ever explore the planet from up close sent information about Mars’ weather conditions, topography, and soil, and even carried out experiments in the search for biological life, the results of which are still debated to this day. After the success of the first lander on Mars, the United States continued the launch of various missions to the planet. NASA' second lander, Viking 2, allowed for soil collecting and the analysis of vast atmospheric readings of the planet. The first rover, Sojourner, aided by the Mars Pathfinder lander, landed in July 1997 and roamed through the planet for two months. By the turn of the millennium, the Mars Global Surveyor became highly successful as its nine-year stay on the planet resulted in an extensive collection of images and data which aided scientists in their studies of the planet for many years.

1998 was the year in which a mission to Mars was first attempted by a nation other than the United States or the Soviet Union—now known as the Russian Federation. The Nozomi Orbiter, created by the University of Tokyo's Institute of Space and Aeronautical Science (ISAS), was a probe meant to carry out a study of the Martian atmosphere in order to contribute to the development of further technology. However, its propelling technology failed a few hours into the launch, causing it to stray away from Mars and go into orbit around the sun instead.

The current position of developing countries in space exploration

In the present day, many developing countries have found themselves in a position in which funding for space exploration would appear to be a superfluous luxury to their governments officials and most of its population. This is given their precarious situations when it comes to their levels of poverty, illiteracy, food insecurity, or, overall, their low standard of living. These conditions do not allow for government effort to be put into the development of space programs. The only field of space research that developing countries would truly seem to be active in is the development and launching of satellites.

Whether for communication, navigation, or Earth observation, satellite technology can bring a lot of benefits to all nations. Satellites are able to provide vital information for the prevention of natural disasters, as well as the advantage of effective communication among a nation's population. As established by The Economist, "most space programmes are designed to get satellites into Earth's orbit for the sake of better communications, mapping, weather observation or military capacity at home. These bring direct benefits to ordinary people." (Delhi, 2013). However, many developing countries do not count with satellites of their own. Their scientists are instead obligated to purchase satellite information from other space agencies or to lease satellites from foreign companies in order to do research. Many nations have concluded that investing in space research programs and the creation of satellites of their own might be more economically helpful in the long-run. As Colonel Lidovino Vielman, head of Paraguay's Space Agency, put it, "satellite services are very expensive, and it's not a bad idea to instead invest that money in a future Paraguayan satellite." (Vielman, 2014). As such, most developing countries have given their first leap into space exploration by creating space agencies specifically founded for the engineering of satellites. According to The Economist, by the year 2013, over seventy countries around the world counted with a space program of their own—even if most of said programs consisted only of small-scale operations with a small number of researchers and very limited launching capabilities.

Despite all of the challenges that the creation of a space program involves for countries without the sufficient resources, there is one developing country that has found a way to succeed and compete in the field of space exploration despite its economic struggles. India stands as the only developing nation in the world so far which has found itself playing an active role in the exploration of Mars. Counting with its own Space Research Organization (ISRO) founded in 1969, India has been an active participant in the creation of space technology for many years now. By launching the Mangalyaan Mars Orbiter Mission into Martian orbit in the year 2013, for instance, this Asian country tried to prove that technological development is closely related to social progress. They strongly believed that by allowing the country to advance technologically, it would advance economically as a direct result. Though this hypothesis was never fully tested or confirmed, the mission was a success, and the country is now planning to launch a second Mangalyaan Mars Orbiter

Mission between the years 2021 and 2022. Because of that, it is believed by members of the international community that, if analyzed with more detail, India's strategies might have great potential to be improved upon and be applied in other developing nations around the world. It is vital to ensure that space technology is a benefit available for all countries, no matter how developed. And it is of great importance that this problem is tackled in a way in which a balance can be reached between the vital needs of developing countries and the expansion of their technological capabilities for the exploration of outer space.

Existing proposals

The role of developing countries in space exploration has previously been tackled by the United Nations a number of times. The Office for Outer Space Affairs has already started providing workshops in many countries as the main way to give developing nations further knowledge of other celestial bodies and the implications of space law. Many member states of the United Nations have petitioned that future outer space technology be shared by developed countries at a reasonable cost. Representatives of different nations have pointed out the importance of space research being available for the benefit of all countries, as well as the exceptional degree of international cooperation which must be involved for said availability to become possible.

There are already existing space missions which are focused on aiding developing nations technologically and might pave the way for these countries to play a role in the future exploration of foreign planets. The Orbital Dream Chaser Mission, for instance, is an opportunity that allows for developing nations to venture into the world of space exploration. As the United Nations' first space mission, it will focus on bringing the benefits of outer space to all countries around the world, no matter their economical position or their current knowledge of outer space. Developed in partnership with the Sierra Nevada Corporation (SNC) and funded by a number of different sponsors, the Orbital Dream Chaser mission is programmed to be launched in the year 2021. It is hoping to send various experiments from different countries into orbit for fourteen days. The experiments will travel aboard Sierra Nevada's reusable Dream Chaser spacecraft, and will receive technical support from UNOOSA. All member states of the United Nations will be able to participate in the mission —yet countries that do not count with a space program of their own will be given priority and encouraged to take part. It is expected that through this mission, an environment of partnership and unity among different nations is be created, ensuring that the exploration of outer space might be carried out in a peaceful, collaborative way.

The United Nations has always believed in the strength of international cooperation for the advancement of developing countries into a modern, more technologically advanced world. A human landing on Mars would require an unprecedented amount of effort, which developing countries might be able to play an important role in contributing to in the future. As such, the Office for Outer Space Affairs calls upon collaboration between its member states, seeking the creation of an action plan which might allow for the integration of developing countries into future missions to Mars. Only through solidarity among various nations can mankind's first arrival in a foreign planet truly represent the achievements of a united global community.

References

1. Carless, W. (2014, June 29th). Why a little country like Paraguay is launching a space program. Recovered 27 June 2019, Public Radio International. Web. <https://www.pri.org/stories/2014-06-29/why-little-country-paraguay-launching-space-program>

2. Cryer, A. (2009). List of missions to Mars, explained. Recovered 14 June 2019, Everything today explained. Web. <https://everything.explained.today/List_of_missions_to_Mars/>

3. National Aeronautics and Space Administration (2019, April 18th). Solar System Exploration: Nozomi. Retrieved 23 June 2019, NASA. Web. <https://solarsystem.nasa.gov/missions/nozomi/in-depth/>

4. National Aeronautics and Space Administration (N.D.). Mars: Historical Log. Recovered 14 June 2019, NASA. Web. <https://marsmobile.jpl.nasa.gov/programmissions/missions/log/>

5. Oxfam International (2013, November 5th). Should India be sending a rocket to Mars when 40% of children are malnourished? Recovered 28 June 2019, Oxfam International. Web. <https://oxfamblogs.org/fp2p/should-india-be-sending-a-rocket-to-mars-when-40-of-children-are-malnourished-vote-now/>

6. Rathi, A. (2013, November 11th). Poor countries want space programs more than rich ones do. Recovered 28 June 2019, Ars Technica. Web. <https://arstechnica.com/science/2013/11/poor-countries-want-space-programs-more-than-rich-ones-do/>

7. Sierra Nevada Corporation (2018, February 6th). Expanding horizons: the case for industry engagement in UNISPACE +50 and beyond. Recovered 26 June 2019, Sierra Nevada Corporation. Web. <http://www.unoosa.org/documents/pdf/copuos/stsc/2018/symp-06E.pdf>

8. Snyder, D. (2001, May). An observational history of Mars. Recovered 14 June 2019, University Lowbrow Astronomers. Web. <http://www.umich.edu/~lowbrows/reflections/2001/dsnyder.7.html>

9. The Economist (2013, November 4th). How can poor countries afford space programmes? Recovered 27 June 2019, The Economist. Web. <https://www.economist.com/the-economist-explains/2013/11/04/how-can-poor-countries-afford-space-programmes>

10. The Planetary Society (2019). Missions to Mars. Recovered 18 June, 2019, The Planetary Society. Web. <http://www.planetary.org/explore/space-topics/space-missions/missions-to-mars.html>

11. United Nations Fourth Committee (2005). Space technologies must benefit all countries, fourth committee told, as it concludes debate on peaceful uses of outer space. Recovered 27 June 219, Fourth Committee. Web. <https://www.un.org/press/en/2005/gaspd323.doc.htm>

12. United Nations Office for Outer Space Affairs (2018). Orbital Space Mission. Recovered 26 June 2019, Office for Outer Space Affairs. Web. <http://www.unoosa.org/oosa/en/ourwork/psa/hsti/FreeFlyer_Orbital_Mission.html>

A

(to) Aid: To help, assist, or support (someone or something) in the achievement of a specific goal.

Astonishing: Extremely surprising or impressive; amazing.

C

Celestial body; celestial object: Any natural object located outside of the Earth's atmosphere.

F

Flyby: A flight past a point, especially the close approach of a spacecraft to a planet or moon for observation.

I

Insight: The capacity to gain an accurate and deep intuitive understanding of an object, a concept, or a situation.

L

Leap: A forceful jump or quick movement.

(to) Lease: To rent out a specific property to a consumer.

M

Manned: (of an aircraft or spacecraft) Carrying a human crew.

Misinterpreted: (of a situation) Poorly or wrongly understood.

N

Nestled: Settled or lying comfortably within or against something, usually a surface or an environment.

P

Precarious: (of a situation) Dependent on chance, uncertain and likely to fail.

(Space) Probe: An unmanned exploratory spacecraft designed to transmit information about its environment.

R

Resurgence: An increase or revival after a period of little activity, popularity, or occurrence.

S

(to) Showcase: To exhibit or display the best parts or qualities of something to a specific audience.

Spacecraft: A vehicle specifically designed for travel in outer space.

Space Race: A non-violent rivalry between the United States of America and the Soviet Union to develop breakthroughs in aerospace capabilities, starting with the launch of the Sputnik I probe in 1958 and ending with the first manned landing on the moon in 1969.

Superfluous: Unnecessary, especially through being more than enough.

T

(to) Tackle: To make determined efforts to deal with a problem or difficult task; to address an issue.

Topography: The study and representation of the arrangement of the natural and artificial physical features of an area.

Turn of the millennium: The years spanning the beginning of the twenty first century.

U

Uncharted: (of an area of land) Not mapped or surveyed.

(to) Undertake: To commit oneself to and begin or take on an enterprise or responsibility.

Unprecedented: Never seen, done, or known of previously.

Topic B

Measures to ensure the responsible and peaceful performance of space mining activities

By: Dante Uriel Pineda Cortés
Emiliano Vizcaíno Arroyo

Introduction

Over the last few years, asteroid mining and other industrial activities that could take place in outer space have become a viable future. Technology has developed in a way which allows for a more complex, more in-depth exploration of outer space. As a consequence, various enterprises have started being developed in order to carry out projects which have never been considered as a true alternative until recently—asteroid mining being the prime example. Asteroids are rich in various metals such as iron, nickel, and gold, which can easily be extracted from these celestial bodies if the right machinery is used. Mining for metals on celestial bodies has great advantages—transferring a part of the mining industry from Earth to outer space might help improve the environmental condition that the planet is currently undergoing. It should, at least, help decrease the alarmingly fast rate at which the planet's resources are being drained, especially in an age which is in a constant need for more metal for the production of electronics and various other products. Considering the positive impact this activity might have on the Earth's environment, the extraction of mineral resources from celestial bodies is an industry which might bloom significantly in the near future. It is because of this that certain companies around the world are beginning to elaborate various strategies for the obtaining of materials in outer space.

However, despite the short-term environmental benefits that asteroid mining might bring, the scientific community has many doubts regarding the possible dangers that the industry could entail. It is estimated that, if left unregulated, unsupervised, and in the hands of private companies, this newborn enterprise could strip entire sections of the solar system bare of any usable resources in a matter of decades. If the solar system's supply of resources were to be exhausted in its entirety, the human race would have to venture even further into space looking for more minerals to use. Each time, more effort would be required for the acquiring of these resources, and the mining industry could become unsustainable in its entirety in a few years. This alarming scenario has led many organisms to look for measures to balance the protection of mineral resources in outer space and their correct usage for human benefit. If the mineral resources found on celestial bodies are used responsibly, the impact of the mining industry on Earth will be vastly reduced. However, regulations must be established in order to make sure that space mining is carried out in a way in which it does not affect the solar system in a fast, uncontrolled manner.

A history of space mining

The core idea behind space mining was born as a consequence of the realization that some resources essential to modern human activities are non-renewable and will run out in a few years. For a long time, both public and private institutions have been researching alternatives to the extraction of the Earth's natural resources in the fulfilling of certain human needs. And for as long as these concerns of overexploitation have existed, mankind has looked to outer space as the next frontier for resource obtention. Since the 1990s, the concept of obtaining materials from extraterrestrial sources has been seen as a possibility by several countries and technology companies. Research on this specific field began by the turn of the twenty-first century, yet many early projects immediately started to crumble, given an array of different factors that made space mining an entirely unviable idea at the time. In spite of the support provided by various governments and private multinational corporations, the lack of technology, the limited amount of knowledge on the subject, and the high price of these proposed ventures made the initiatives sound utopic.

The primal deterrent for the earliest space mining enterprises, however, was a treaty established by the United Nations. The Treaty on Principles Governing the Activities of States in the Governing and Use of Outer Space, more commonly referred to as the International Treaty of Outer Space, was signed in the year 1967 by 109 countries. To this day, its stipulations continue to make up the foundations of international space law. This agreement stipulates that no government can claim any portion of outer space as its own, and that no extraterrestrial territory can ever be treated as a privatized land. Under this international settlement, no country can own a portion of outer space. As such, this agreement proves to be a problem when it comes to the establishment of industrial projects in outer space.

Throughout the early years of the twenty-first century, space technology continued developing. For instance, the first spacecraft to land on an asteroid was Hayabusa, an unmanned craft developed by the Japan Aerospace Exploration Agency (JAXA). Returning back to Earth in 2010, Hayabusa had collected a wide variety of samples from near-Earth asteroid Itokawa. This first prospecting probe proved to be a success. However, it was the only significant advance in the field for a long time, despite all the research which was being done. By the beginning of the 2010s, Luxembourg was one of the first countries to invest in space mining, aiming to exponentiate the economy of the nation. It was not until the year 2015 that a major change was made when Barack Obama, former president of the United States of America, enacted a bill entitled the Commercial Space Launch Competitiveness Act. This law states that individuals and private companies are able to mine asteroids to obtain resources, and that they are entitled to any the materials that they might acquire in doing so. This law still does not change the stipulation, however, that no government or company has the ability of claiming a celestial body as their own. While the law only applied to American companies, it was a significant step in the right direction when it came to the establishment of a legal basis for space mining. In response to this bill, many private companies began to make investments in the field. One of the companies benefited as a direct result of the law, for instance, was Planetary Resources, a company which soon after sent three satellites to monitor asteroids. A few months later, different countries around the world found themselves pursuing their own space mining projects.

Space mining today

Luxembourg was the first country to make significant progress in the field of space mining following the establishment of the United States' Commercial Space Launch Competitiveness Act. In 2016, Luxembourg created the SpaceResources initiative, a program legally backed by the Competitiveness Act, which had been passed just one year earlier. Similarly to the American law, the SpaceResorces initiative aimed to give companies the right to obtain resources from outer space without violating the 1967 International Treaty of Outer Space. The initiative brought together different private and public organizations in order to promote the research in the field of space mining. The government of Luxembourg, the American corporation Planetary Resources, and iSpace, a private Japanese initiative, were among the first institutions to join the initiative and aid Luxembourg with the research and development of technology for future space mining missions. By widening its reach to international space organizations and providing financial benefits to companies that agree to participate in space mining projects, the SpaceResorces initiative has proven to be one of the most successful space mining projects that have been established by any country so far.

In 2017, Luxembourg passed a space mining law as a part of the SpaceResorces initiative, reviewing and loosening the restrictions previously set for the acquiring of mineral resources in celestial bodies. This new law led to the signing of various agreements with different countries around the world, in order to ensure their collaboration with Luxembourg in ongoing and future space mining projects. Soon enough, many global powers became a part of Luxembourg's legal framework when it comes to the mining of asteroids. The United States and the Russian Federation became Luxembourg's most powerful allies when it comes to space mining. Luxembourg also began to collaborate with countries such as the United Arab Emirates and Portugal, and an agreement with the Japanese government was reached in order to facilitate the exchange of information relevant to the numerous space mining projects currently being carried out by Luxembourg. In early 2018, Luxembourg enacted an official Space Resources Act, and in September of that same year, the Luxembourg Space Agency was created, providing the country with even more possibilities for space exploration. The creation of this space agency was a key factor in the unexpected solidification of Luxembourg's position as one of the world's most influential participants in the determination and execution of modern space law.

Another key player in the space mining industry as of today is the United Kingdom of Great Britain and Northern Ireland. The private Asteroid Mining Corporation, one of the most important actors in the industry in recent years, is headquartered in said country. Established in the year 2016 by young entrepreneur Mitch Hunter-Cullion, it defines itself as "a young aerospace startup company on a mission to exploit the potential of an off-Earth commercial market" (Asteroid Mining Corporation Limited, 2019). This private corporation operates within the legal framework of the United Kingdom's Space Resources Activities Bill, a law passed in the year 2018 which "takes measures for the implementation of the right to explore and use outer space and celestial bodies for the purpose of extracting space resources, in accordance with applicable international law" (British Parliament, 2018). Along with the 2018 Space Industry Act, this bill allows for British companies to perform a variety of activities in outer space. It also establishes several regulations, most of which are modeled after the 1986 United Kingdom Outer Space Act. Ever since its inception, the Asteroid Mining Corporation has been slowly developing a number of different spacecraft for the prospecting, exploration and extraction of mineral resources from an array of celestial bodies. Its main mission, however, is the launch of the first ever prospector satellite, APS-1, in the year 2020. The mission's main objective is to analyze over 5000 near-Earth celestial bodies and determine the most viable candidates for space mining. Even though the mission will not carry out mining activities yet, it will lay the foundation for future missions, many of which continue to be developed by the Asteroid Mining Corporation.

The benefits of space mining

On a surface level, asteroid mining is an industry which has plenty of both short-term and long-term benefits. Whether as a mere tool for monetary revenue or the provider of much needed resources to fuel human activities, space mining has captured the interest of many individuals which might, in the future, be well fitted to exploit celestial bodies. The main benefit that can be obtained from an extraterrestrial mining industry is the reduction of mining activities on Earth. Asteroids are rich in materials such as cobalt, nickel, iron and platinum, metals that are largely needed in the modern world—resources that the Earth counts with a limited amount of, and are already in danger of running out in a matter of decades.

Asteroids, on the other hand, are estimated to contain a larger amount of mineral resources than those found on planet Earth. These celestial bodies have also been found to contain gold and other rare, precious metals, which might lead different companies to be involved in a new gold rush. The asteroid 16 Psyche, for instance, has been found to be really rich in nickel and gold, and it is expected to be worth around seven hundred quintillion dollars. It is estimated that, collectively, the amount of mineral resources located in near-Earth celestial bodies should allow humanity to carry out the mining of asteroids and obtain significant results for approximately three thousand years. At first sight, space mining seems to be a rather viable way of obtaining resources.

The possibility of finding asteroids that can be used for the mining industry without traveling a very long distance it is rather high. It is estimated that ten thousand asteroids pass by the Earth every year, and most of them are believed to contain precious mineral resources contained within them. NASA has determined that a thousand and five hundred near-Earth asteroids are easily accessible. Private corporations such as SpaceX have been conducting expeditions in collaboration with the International Space Station in order to explore the possibility of asteroids as a possible source of raw mineral materials in the future. The results of these explorations have been positive, and new ways to use asteroids for the benefit of humanity continue being sought. Asteroid mining also appears to be a self-sustainable enterprise. The high amount of mineral resources found in outer space might allow for an increased amount of interest and investing in outer space missions. This would to an increased funding for future undertakings, and the broadening of said missions' technological capacity more each time, allowing for a greater exploitation of extraterrestrial resources. Given all of the advantages that this innovative industry has, the utilization of asteroids as an alternative source of prime materials is a reasonable alternative—especially as a mean to reduce the dangerous impact of mining activities on Earth.

Scientific concerns

The usage of asteroids as a way to obtain resources can be considered dangerous to the stability of the solar system in particular. Like any other way to acquire raw materials, space mining will exploit the materials of the asteroids and may generate pollution and can diminish exponentially the resources of our system. Some scientist believes that at least 85% of the solar system should be protected of exploitation of their raw materials. They expect that if we do not protect our system in a few years we will be in a crisis of resources like no other. An estimation made in a publication in the magazine Acta Astronoutica suggest that if space is used as a farm to acquire resources space will run out of raw materials in only 400 years. Another concern is the increasing amount of commercial opponents that have been expecting to begin explorations, so it's a worry for the scientific community that resources will be used and obtain as recklessly as they do on earth.

Martin Elvis is an Astrophysicist from the Smithsonian Astrophysical Observatory; he proposes that the Solar System should be called "Space Wilderness", in order to stop the possible massive exploitation of outer space. Because it is prohibited to use any celestial body for acquiring resources, if they are called that way, for the protection of the rampant usage of raw materials. He also states that if we as a society exploit the universe, we will not have another alternative to continue providing the essentials to continue living. The scientific community is expecting an event similar to the “Gold rush” that occurred a few years ago. So for them, it is imperative to stop or to modify the procedures used for extracting materials in outer space, so that, the universe does not lose resources as irresponsibly as on Earth.

References

1. Allen and Overy (2017, September 28th). Luxembourg Space Resources Act: Paving the legal road to space. Recovered July 9th, 2019, Allen and Overy. Web. <http://www.allenovery.com/publications/en-gb/Pages/Luxembourg-Space-Resources-Act-Paving-the-legal-road-to-space.aspx>

2. Asteroid Mining Corporation Limited (N.D.). About us. Recovered June 2nd, 2019, Asteroid Mining Corporation. Web. <https://asteroidminingcorporation.co.uk/>

3. Asteroid Mining Corporation Limited (N.D.). UK Space Resources Activities Bill. Recovered July 10th, 2019, Asteroid Mining Corporation. Web. <https://asteroidminingcorporation.co.uk/>

4. Bjork, C. (2018, December 12th). The Luxembourg Space Resources Act and International Law. Recovered July 9th, 2019, DipLawMatic Dialogues. Web. <https://fcilsis.wordpress.com/2018/12/12/the-luxembourg-space-resources-act-and-international-law/>

5. Casey, JP. (2019, March 18th). History of space mining: five key events for mineral exploration in space. Recovered July 8th, 2019, Mining technology. Web. <https://www.mining-technology.com/digital-disruption/history-of-space-mining/>

6. Casey, JP. (2019, March 7th). Russia begins talks with Luxembourg over space mining agreement. Recovered July 10th, 2019, Mining technology. Web. <https://www.mining-technology.com/news/russia-begins-talks-with-luxembourg-over-space-mining-agreement/>

7. David, L. (2018, September 4th). The US Geological Survey Is Getting Serious About Space Resources and Mining. Recovered July 11th, 2019, Space.com. Web. <https://www.space.com/41707-space-mining-usgs-resource-survey.html>

8. The Financial Times LTD. (2019). Special report: Space Mining. Recovered June 2nd, 2019, Financial Times. Web. <https://www.ft.com/reports/space-mining>

9. Foust, J. (2019, May 10th). United States and Luxembourg sign space cooperation agreement. Recovered July 10th, 2019, Spacenews. Web. <https://spacenews.com/united-states-and-luxembourg-sign-space-cooperation-agreement/>

10. Foust, J. (2018, September 13th). Luxembourg establishes space agency and new fund. Recovered July 10th, 2019, Spacenews. Web. <https://spacenews.com/luxembourg-establishes-space-agency-and-new-fund/>

11. Griffin, A. (2015, November 26th). Asteroid mining made legal after Barack Obama gives US citizens the right to own parts of celestial bodies. Recovered July 8th, 2019, The Guardian. Web. <https://www.theguardian.com/science/2019/may/12/protect-solar-system-space-mining-gold-rush-say-scientists>

12. The government of the Grand Duchy of Luxembourg (N.D.). Space Resources: Exploring New Frontiers. Recovered July 9th, 2019, Space Resources. Web. <https://spaceresources.public.lu/en.html>

13. Latuszek, N. (2018, August 27th). Scottish firm to launch UK's first asteroid mining mission. Recovered July 11th, 2019, Mining dot com. Web. <https://www.mining.com/scottish-firm-to-launch-uks-first-asteroid-mining-mission/>

14. O'Neill, C. (2018, July 30th). Glasgow space company launches asteroid mining mission. Recovered July 11th, 2019, Glasgow Live. Web. <https://www.glasgowlive.co.uk/news/glasgow-news/glasgow-space-company-launches-asteroid-14967685>

15. Planetary Resources (N.D). Why asteroids. Recovered July 9th, 2019, Planetary Resources. Web. <https://www.planetaryresources.com/>

16. Soldatkin, V. (2019, March 6th). Russia wants to join Luxembourg in space mining. Recovered July 10th, 2019, Reuters. Web. <https://www.reuters.com/article/us-luxembourg-russia-space/russia-wants-to-join-luxembourg-in-space-mining-idUSKCN1QN1OQ>

17. Vyas, K. (2019, January 2nd). Mining in Space: what it means for the economy. Recovered June 2nd, 2019, Interesting Engineering. Web. <https://interestingengineering.com/mining-in-space-what-it-means-for-the-economy>

A

Array (of): A large group of things or people, especially one that is attractive, causes admiration or has been positioned in a particular way.

B

(to) Bloom: To flourish or thrive; to succeed.

C

(to) Crumble: (of an organization, relationship, or structure) To disintegrate gradually over a period of time, to fall or break apart.

D

Drained (from): (of a resource) To be lost, wasted, or used up; deprived of its strength or vitality.

Deterrent: A thing or situation that discourages or is intended to discourage someone from carrying out a specific situation; an obstacle.

E

(to) Enact: To create a new law.

(to) Entail: To involve something or someone as a necessary or inevitable part or consequence.

Enterprise: A project or undertaking, typically one that is difficult or requires effort.

Entitled (to): Having a legal right or a just claim to receive or do something.

F

Fulfilling: (of an object) Able to carry out a task, duty, or role as required, pledged, or expected.

L

(to) Loosen: To make something fixed in place less tight or firm.

N

Newborn: (of an enterprise) Recently formed or funded.

O

Overexploitation: The usage of something, such as a natural resource, to an excessive degree.

P

Prospecting Probe: An exploratory spacecraft specifically designed for the extraction of mineral resources from celestial bodies.

R

(to) Regard: To consider or think of someone or something in a specified way.

S

Stipulation: A condition or requirement that is specified or demanded as part of an agreement.

(to) Strip bare (of): To remove something (from something or someone) in its entirety.

U

Unmanned: (of a spacecraft) Not having or needing a crew or staff.

Unsustainable: (of an activity) Not able to be maintained at the current rate or level at which it is being performed.

V

Venture: A risky or daring journey or undertaking.

(to) Venture: To dare to do something or go somewhere that may be dangerous or unpleasant.

Viable: Capable of working successfully, feasible.