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Proposal on the Creation of a New Space Organization for the Moon and Celestial Bodies' Exploitation

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Contents

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Ⅰ. Introduction

The creation of a new International Space Exploitation Agency (ISEA: tentative name) would lead to a strengthening of the cooperation deemed essential by the global community towards joint undertakings and exploitation of the natural resources of the moon, Mmars, Venus, Mercury and other celestial bodies would act as a catalyst for the efforts on space exploitation and allow resources, technology, manpower and finances to be centrally managed in an independent fashion to the benefit of the mankind. *"Space already exists for the global community, so the question is what we do there."*

It's our job to make sure that all opportunities are used to integrate the power and exploitation of the moon, Mars, Venus and other celestial bodies among the global all countries. In the 21st century, space science and technology will develop with ever greater rapidity. Having developed rapidly for about half a century, some space superpowers and organization such as the United States, European Union, Russia, China, Japan, India etc. with space activities have scored remarkable achievements that greatly promoted the development of social productivity and progress. The continuous development and application of space technology has become an important role in the modernization drive of the world community.

The emergence of aerospace technology in the global countries has brought huge contributions to economic and social progress. Nevertheless, in order to allow such an exploitation to start a major obstacle must be solved, namely the absence within the space organization of specific rules establishing how this exploitation has to take place and what are the rights and duties of the parties involved in it. As it will be explained in the following paragraphs, space law does not contain any dedicated rule, dealing with the exploitation of extraterrestrial resources, which has received the general acceptance of States.[1)]

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1) Fabio Tronchetti, *A legal regime to govern the exploitation of the natural resources of the Moon and other celestial bodies,* The Korean Journal of Air and Space Law (Vol.23,No.1, 2008), p.168.

Ⅱ. Joint Exploitation of the Natural Resources (Helium-3, etc.) in the Moon and ISEA

The moon, Mars, Venus,[2] Mercury and other celestial bodies of our solar system contained large quantity of natural resources. The exploitation of the natural resources of the moon and other celestial bodies represents one of the most existing future developments in the field of space law as well as a unique occasion for the economic and social growth of mankind as a whole. As it is well-known, mankind is currently facing an energetic crisis. The large number of benefits that are expected to be generated from the exploitation of these resources, indeed, not only will contribute to the betterment of conditions of peoples on earth but also will allow mankind to face and likely solve one of the biggest problems currently affecting our planet, namely the exhaustion of the stocks of raw materials and other source of energy, such as fossil fuels.

There is no doubt that one of the most difficult problems that a peaceful world will face in the 21st century will be to secure an adequate, safe, clean, and economical source of energy.

Existence of lunar helium-3, to be used as fuel for fusion reactors, is well documented; verified from numerous Apollo and Luna mission samples, current analyses indicate that there are at least 1 million tones embedded in the lunar surface.

The helium-3 would be used as fuel for fusion reactors. Moon gas may solve earth's energy crisis. If the current trends of energy on earth, scientists anticipate that the energy resources oil after 40 years, natural gas after 60 years, and uranium after 65 years will be dried up. So the research of the nuclear fusion for electric generator is progressed for long time. The solar energy is similar to creating the *'artificial sun'*. A scientist warns of the exhaustion of fossil fuels such as coal, oil and natural gas on earth. By 2050 the whole world will have a major problem. We need to be thinking ahead. Right now we are not thinking ahead enough. Scientists estimate there

2) http://en.wikipedia.org/wiki/Venus

is about 1 million tons of helium-3 on the moon, enough to power the world for thousands of years. The equivalent of a single space shuttle load or roughly 25 tons could supply the entire United States' energy needs for a year, according to Apollo17 astronaut and researcher Mr. Harrison Schmitt of the Fusion Technology Institute (FTI).[3] The stocks of raw materials are running out and experts estimate that fossil fuels will be finished by 50~60 years.

Helium-3, indeed, has the potential to solve this crisis thanks to its capacity to replace fossil fuels and other substances as primary source of energy on earth. As to the moon, it presents vast amount of mineral resources distributed uniformly across its surface and subsurface.

Manned and unmanned explorations have demonstrated that the moon is rich of ① aluminum, ② iron, ③ silicon, ④ oxygen, ⑤ hydrogen, ⑥ chromium, ⑦ manganese, ⑧ potassium, etc. These minerals can be utilized in their original form or refined into structural and electrical materials. They can be brought back to earth or used for life support of a permanent lunar basis or as rocket propellant.[4]

For instance, oxygen and hydrogen are contained in the lunar regolith at all latitudes. There is also evidence that the lunar poles contain amounts of water and ice. It is still not well-known how vast this amount is. However, in case of a large presence of water, this could have an enormous impact as rocket propellant and life-support materials for astronauts. A potential gas source found on the moon's surface could hold the key to meeting future energy demands as the earth's fossil fuels dry up in the coming decades.

When compared to the earth the moon has a tremendous amount of helium-3," when helium-3 combines with deuterium (an isotope of hydrogen) the fusion reaction proceeds at a very high temperature and it can produce awesome amounts of energy. The most valuable resource contained on the moon, however, is helium-3. The helium-3 represents, indeed, the main reason behind the attention of States and private

3) http://fti.neep.wisc.edu/fti?rm=gallery

4) It has been estimated that 25 tones of Helium-3 can provide all the power that the United States needs in a year, See Sci/Tech. Moon map aids discovery at http://news.bbc.co.uk/1/hsci/tech/2260

operators for exploiting extraterrestrial resources. The raw material helium-3 for the Nuclear Fusion Reactor is not embedded in the earth, but it is estimated to be embedded 1 million tones~500 million tones in the lunar surface. Approximately one million tons of helium-3 is a quantity to use and create the energy for 500 years in the global community.

Helium-3 is an isotope, rare on earth but abundant on the moon, which combined with other materials, such as deuterium, can be used as a fuel in fusion power reactors.

The value of helium-3 is that it can generate nuclear power and, as a consequence, energy in a clean way, namely through a process of nuclear fusion which does not produce toxic waste. Thanks to these special characteristics, the extraction of helium-3 is likely to have a huge impact on the way energy is produced and distributed on earth. Helium-3 is deposited on the lunar surface by solar winds and would have to be extracted from moon soil and rocks. To extract helium-3 gas the rocks have to be heated above 800 degrees Celsius. The 200 million tones of lunar soil would produce one tone of helium.

Only 10 kilograms of helium-3 are available on earth.[5] As space superpowers such as the United States, Russia, European Union, China, Japan and India has interested in helium-3 that it is more expensive 300 times than gold, so it may be become a supremacy country in the future resources war from mining helium-3 in the moon to bring it to earth for the purpose of getting it in advance.

The helium-3 fusion energy may be the key to future space exploration and settlement. As we must promote the development of the moon's natural resources including Helium-3 in order to resolve in advance the depletion of energy resources in the global community after 50-60 years, so it is absolutely necessary the active and reciprocal cooperation of space science and technology in the first place among the space superpowers. It is desirable for us the establishment of the ISEA in order to be efficient and rapid development among the abovementioned countries so as to manage, allotment and the adjustment for the development and exploration of moon

5) http://www.abc.net.au/news/newsitems/200411/s1252715.htm

natural resources including helium-3. The creation of ISEA is possible to promote the unification of the window for negotiations in cooperating of the space science and technology among the United Nations Committee on the Peaceful Use of Outer Space (UNCOPUOS), the United States (National Aeronautics and Space Administration: NASA), European Union (European Space Agency: ESA), China (China National Space Administration: CNSA), Japan (Japan Aerospace Exploration Agency: JAXA) and India (Indian Space Research Organization; ISRO) including Korea (Korea Aerospace Research Institute: KARI) etc. for exploiting of the moon and other celestial bodies' natural resources. Moreover it is necessary and fruitful for mankind to establish the new ISEA as soon as possible.

If it is established the ISEA in the near future, the ISEA will be developed many the natural resources of the moon in cooperation with the developed countries and is able to create a fund to collect 10 percent commission for the authorization of mining right them in the moon due to the mankind's common heritage for the moon's natural resources based on the Article 11 of the 1979 Moon Agreement. The ISEA will be used these funds for the economic aid and support for space exploration and research in developing countries such as African countries etc.

Ⅲ. Activities for the exploitation of Moon and Other Celestial Bodies by the Space-Faring Powers

1. The United States

NASA's Lunar Reconnaissance Orbiter (LRO) and the Lunar Crater Observation and Sensing Satellite (LCROSS) launched aboard an United Launch Alliance Atlas V rocket from Cape Canaveral Air Force Station on June 18, 2009. The LRO and

LCROSS spacecraft were tucked inside the payload fairing at the top of the rocket to protect them from atmospheric heating as the rocket climbed through the atmosphere toward space. The fairing separated as planned and LRO pushed away from LCROSS and the Centaur stage on its way to going into orbit around the moon. The LCROSS probe remained attached to the Centaur and will steer the empty rocket stage for about four months as mission controller's line up LCROSS and Centaur to collide with the moon in an effort to determine conclusively whether water exists on the lunar surface.

LCROSS is equipped with sensors to evaluate the plume from the Centaur stage when it hits the moon. Then LCROSS will fly through the plume before crashing into the lunar surface to kick up a second plume.[6] NASA now opened a new chapter in our understanding of the moon. Preliminary data from the Lunar CRater Observation and Sensing Satellite, or LCROSS, indicates that the mission successfully uncovered water during the Oct. 9, 2009 impacts into the permanently shadowed region of Cabeus cater near the moon's south pole. Scientists have long speculated about the source of vast quantities of hydrogen that have been observed at the lunar poles. The LCROSS findings are shedding new light on the question of water, which could be more widespread and in greater quantity than previously suspected. Multiple lines of evidence show water was present in both the high angle vapor plume and the ejecta curtain created by the LCROSS Centaur impact. On December 4, 2006, NASA announced it was planning to build a permanent moon base.[7]

A lengthy National Research Council (NRC) report into the US Human Space Flight program cited the need for a "Pathway" approach to NASA's exploration ambitions, stepping stones that would result in the ultimate goal of landing humans on the surface of Mars. The 285 page report, released on June 4, 2014, provided a refined view of NASA's current road-map, claiming international cooperation – including an alliance with the Chinese – and the potential use of the Moon as a proving ground, is required

6) http://www.nasa.gov/mission_pages/LCROSS/launch/index.html

7) NASA Office of Public Affairs (December 4, 2006). "GLOBAL EXPLORATION STRATEGY AND LUNAR ARCHITECTURE"(PDF). NASA. http://www.nasa.gov/pdf/164021main_lunar_architecture.pdf.

to achieve the “Horizon Goal.”[8] NASA Associate Administrator Scott Horowitz said the goal was to start building the moon-base by 2020, and by 2024, has a fully functional base that would allow for crew rotations and in-situ resource utilization. Additionally, NASA plans to collaborate and partner with other nations for this project.[9] On September 28, 2007 Michael D. Griffin, who was at the time Administrator of NASA, stated that NASA aims to put a man on Mars by 2037.[10]

US President Barack Obama set a bold new course for the future of US space travel when he announced plans to send US astronauts into the orbit of Mars within the next three decades. President Obama made a whirlwind trip after stinging criticism of his decision to end the costly Constellation program, a project to return US astronauts to the moon.

President Obama said his administration would pump six billion more dollars into the NASA budget over the next five years. ″By 2025 we expect new spacecraft designed for long journeys to allow us to begin the first ever crew missions beyond the moon into deep space. By the mid-2030s, I believe we can send humans to orbit Mars and return them safely to earth, and a landing on Mars will follow.″ The United States would also invest some three billion dollars in research on a heavy-lift rocket to send crew capsules and supplies into deep space, with the design to be finalized by 2015.[11]

2. European Union

The first Lunar Exploration Study (LES) of European Space Agency (ESA) completed in December 2004 designed in detail two separate vehicles such as an Orbital Habitation Module or Hub and a Lunar Excursion Vehicle (LEV).

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8) alliance

9) Hawkins-Cox, Diane (December 5, 2006). ″NASA wants permanent moon base″. CNN; http://www.cnn.com/2006/TECH/space/12/04/moon.base/index.html. Retrieved July 15, 2009.

10) NASA aims to put man on Mars by 2037″. Independent Online. September 25, 2007. Retrieved July 15, 2009.

11) http://news.yahoo.com/s/afp/20100416/ts_alt_afp/usspaceobama

The Hub will provide support in polar lunar orbit for six crew members for six months. The LEV will provide de-orbit, descent, landing and ascent from the lunar surface, Hub-automated rendezvous and docking with the Hub and life support during these phases and 14 days surface operations for three crew members. The second CDF Lunar Exploration Study (LES-2) completed in May 2005 was charged to further analyze a Lunar Cargo Transport System (LCTS) to supply the Hub and supply a Lunar Surface Base or provide lunar surface precursor mission capability.[12)]

At ESA, the first step identified by LEDA was launched. The project was called EURO MOON 2000 and it aimed at delivering a Lander on the "Peak of eternal light" on the rim of the 20 km-diameter Shackleton South Pole Crater. Again the A&R Section provided support for Robotics issues. However due to lack of adequate funding the EURO MOON 2000 was cancelled by ESA's Director General on March 25, 1998.

Setting up a lunar base of ESA could be made much simpler by using a 3D printer to build it from local materials on 31 January 2013. Industrial partners including renowned architects Foster + Partners have joined with ESA to test the feasibility of 3D printing using lunar soil. The base's design was guided in turn by the properties of 3D-printed lunar soil, with a 1.5 ton building block produced as a demonstration.[13)]

Mars Express was launched on 2 June 2003 and arrived at Mars six-and-a-half months later. It has since orbited the planet nearly 12 500 times, providing scientists with unprecedented images and data collected by its suite of scientific instruments.

The images in this movie were taken by the High Resolution Stereo Camera and the video was released by the DLR German Aerospace Center as part of the ten years of Mars Express celebrations in June 2013.[14)]

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12) The second CDF Lunar Exploration Study (LES-2) completed in May 2005 was charged to further analyse a Lunar Cargo Transport System (LCTS) to supply the Hub and supply a Lunar Surface Base or provide lunar surface precursor mission capability.

13) http://www.esa.int/Our_Activities/Technology/Building_a_lunar_base_with_3D_printing

14) http://www.esa.int/spaceinvideos/Videos/2013/10/Mars_showcase

3. Russia

Luna-Glob (Lunar sphere) is the name of a Moon-exploration program by the Russian Federal Space Agency (Roscosmos) based on plans dating back to 1997.

Due to financial problems, however, the project was put on hold only to be revived a few years later. Initially scheduled for launch in 2012,[15] the mission has been brought forward twice, first to 2010 and then to 2009.

However, as of late 2008, the plan is again to meet the original 2012 launch date.

Luna-Glob is the first of four missions planned before the creation of a fully robotic lunar base scheduled for after 2015. Luna-Glob 1 is an unmanned mission to the Moon planned by Russia including an orbiter with ground penetrating sensors.[16]

Luna-Glob is slate to be launched in 2012 by Soyuz 2 rocket.[17] A Luna-Glob joint orbiter-rover mission (the orbiter will be the Indian Chandrayaan-2), is also planned for in 2012, and will feature a 58 kg Russian Polar Moon Rover and lander, as part of the International Lunar Network.

This mission will land in Moon's South Pole, examine a crater and operate for up to one year. The six wheeled, solar powered rover will land near one of the poles and will survive for a year, roving up to 150 km at a speed of 360 m/h. The next two missions,[18] to be called Luna-Grunt, will launch in 2014, featuring an orbiter and a lander. The lander carries a large 400 kg rover capable of in-situ soil analysis.

Later, in 2015, a second lander with an 400 kg ascent stage will return up to 1kg of surface and rock samples. The Lunnyj Poligon robotic lunar base[19] that follows Glob and Grount would be a "Robotic proving ground", consist of several components: ① solar power station, ② tele-communication station, ③ technological station, ④

15) Lavochkin begins phase B work for Luna-Glob 1 orbiter. Retrieved 2008-10-16.
16) Russia Plans Ambitious Robotic Lunar Mission". Aviation Week. 2008-06-27.
17) Lavochkin begins phase B work for Luna-Glob 1 orbiter. Retrieved 2008-10-16.
18) PROGRAM OF THE MOON EXPLORATION BY AUTOMATIC SPACE COMPLEXES; ESA. PROGRAM OF THE MOON EXPLORATION BY AUTOMATIC SPACE COMPLEXES". ESA. Retrieved 2008- 10-21.
19) "Russian project Luna-Glob: goals and status". Retrieved 2008-10-21.

scientific station, ⑤ long-range research rover, ⑥ landing and launch area, ⑦ orbiting satellite. This project is planned for 2020. Russian Space Agency, Energia Chief Executive Nikolai Sevastyanov has given indications that his company will be able to provide moon exploitation options to the Russians, even before the their Kliper shuttle starts service in 2015. A new, modified version of the Soyuz TMA vehicle, either manned or remotely controlled via a new digital system, could be used to extract the lunar reserves of Helium-3, according to Russian media agency RIA Novosti.

While Helium-3 holds great value to the new range of fusion nuclear power stations, it is not known why Sevastyanov would see value in an earlier target of exploitation from the lunar surface, when the new power stations are believed to be decades away from making Helium-3 commercially viable.

The flamboyant-yet influential-Energia CEO is under no illusions about the 2012~2014 timeline it would take for his company to support Russia's first manned mission to the Moon, including the mining of isotope helium-3 by 2020. Now it would seem his targets are not restricted to the introduction of the Kliper. This was hinted at before, during a wide-ranging interview with Vedomosti magazine. 'We could make a landing as early as 2012-2014 using the Soyuz-type technology,' he said.

With a budget within $2 billion, we could land on the Moon in three missions.

'The first would be just a lunar fly-around mission, the second would involve a circumlunar orbit injection with automatic landing of the lunar module, and the third would be the manned landing on the Moon. 'As for the industrial transportation system to support regular missions to the Moon and lunar mining operations, we could develop it by as early as 2020.' During that interview, Sevastyanov showed signs of his passion for being involved in a mission that he believes is critical for our planet.

'We must do this within the lifetime of our generation, first of all because of the limited nature of energy resources,' he added. 'One way or the other, but we will have to go beyond our planet in the search of new environmentally friendly power sources. 'A good candidate is isotope helium-3 to be used for nuclear power. It is available on the Moon. 'The earth's reserves of helium-3 are so negligible that their

industrial use is absolutely out of the question. According to some estimates, our natural satellite contains no less than 1 million tons of helium-3, which can fully meet the entire Earth's power demand for a period of more than 1,000.[20] In the longer term, Japan envisages developing the necessary technology for the establishment and utilization of a human lunar base, and aims to realize a "Deep Space Harbor" at the Moon and/or a Lagrange Point as a basis for future extended human activities in the Solar System.

4. China

Chinese Lunar Exploration Program (CLEP) is a program of robotic explorations and human missions to the Moon undertaken by the China National Space Administration (CNSA). Chang'e 1 (嫦娥一号)was an unmanned Chinese lunar-orbiting spacecraft, part of the first phase of the Chinese Lunar Exploration Program. The spacecraft was named after the Chinese moon goddess, Chang'e.[21] It uses Chang'e lunar orbiters, rovers and soil return spacecraft and adapted Long March 3/A (長征三号A), Long March 5/E and Long March 7 launch vehicles. The first spacecraft of the program, Chang'e 1 an un-manned lunar orbiter was successfully launched at Xichang Satellite Launch Center on October 24, 2007.[22] China's first lunar probe, Chang'e-1, is orbiting successfully the moon.

Chang'e-2 (嫦娥二号), is a Chinese un-manned lunar probe. Chang'e 2 spacecraft was launched on 1 October 2010, aboard a Long March 3C rocket from at Xichang, Shichuan in China. Chang'e 2 is similar to Chang'e 1 with some improvements, including a better camera with a resolution of one meter. The spacecraft entered an orbit with a perigee of 200 kilometers and apogee of 380,000 kilometers and separated from the carrier rocket as planned. It was the first time that a Chinese lunar probe

20) http://www.nasaspacef.light.com/2006/04/russian-moon-exploitation-soyuz-involved
21) http://en.wikipedia.org/wiki/Chang'e_1
22) http://en.wikipedia.org/wiki/Chang'e_program

directly entered the earth-moon transfer orbit without orbiting the earth first. After the launch, Chang'e 2 was expected to arrive at its lunar orbit in about 112 hours (about 4 days and 16 hours), much faster than the 12 days taken by Chang'e 1.

Chang'e 3 (嫦娥三号) is an unmanned lunar exploration mission operated by the China National Space Administration (CNSA), incorporating a robotic lander and China's first lunar rover. It was launched in December 2013 as part of the second phase of the Chinese Lunar Exploration Program. Chang'e 3 achieved lunar orbit on 6 December 2013 and landed on 14 December 2013, becoming the first spacecraft to soft-land on the Moon since the Soviet Union's Luna 24 in 1976. [23]It was China's first lunar rover, part of the second phase of the Chinese lunar exploration program undertaken by the CNSA.[24] The lander used variable thrusters to make a vertical landing on the surface near the Moon's equatorial region and worked on the surface for three months.

Energy will be provided by radioisotope thermoelectric generator that the rover can operate through lunar nights. The third phase of the lunar exploration program is planned for 2017, entailing the use of the CZ-5/E heavy launch vehicle. On the basis of the lander mission, a lunar sample return mission will be undertaken, with up to two kilograms of lunar samples being returned to Earth. China' also plans the moon base construction and China space station in 2022.[25] After that, a manned lunar landing might be possible in 2025 – 2030.[26]

5. Japan

SELENE (Selenological and Engineering Explorer), better known in Japan by its nickname Kaguya (かぐや), was the second Japanese lunar orbiter spacecraft. Produced by the Institute of Space and Astronautical Science and NASDA (both now

23) http://en.wikipedia.org/wiki/Chang'e_3
24) http://en.wikipedia.org/wiki/Chang'e_3
25) http://english.cri.cn/2906/2007/03/11/65@204310.htm
26) http://en.wikipedia.org/wiki/Chinese_Lunar_Exploration_Program

part of the Japan Aerospace Exploration Agency, JAXA), the spacecraft was launched September 14, 2007. After successfully orbiting the moon for 1 year and 8 months, the main orbiter was intentionally crashed onto the lunar surface near Gill lunar crater at 18:25 UTC on June 10, 2009.[27] JAXA succeeded in launching Lunar orbit explorer *Kaguya*, also known as SELENE (costing 55 billion yen including launch vehicle), the largest such mission since the Apollo Program, on an H-2A rocket. Its mission is to gather data on the moon's origin and evolution. It entered into a lunar orbit on October 4, 2007. The JAXA and NHK (Japan Broadcasting Corporation) have successfully performed the world's first high-definition image taking by the lunar explorer "KAGUYA" (SELENE) which was injected into a lunar orbit at an altitude of about 100 km on October 18, 2007. The image shooting was carried out by the onboard high definition television (HDTV) of the KAGUYA, and it is the world's first high definition image data acquisition of the Moon from an altitude about 100 kilometers away from the Moon.[28]

Consisting of a 3-ton main orbiter and two 50-kilogram sub-satellites, Kaguya is equipped with 14 scientific instruments and a high-definition television camera. Human Lunar Systems Team of Japan works for the conceptual system study on the future human lunar outpost. Based on the achievements and lessons learned from the International Space Station Program, system architecture on the basis of the international cooperation and the way of Japan's contribution are discussed continuously.[29] Japan and China have also plans to send manned missions to moon in 2020.[30]

Hayabusa 2(はやぶさ**2**) is the follow-on mission to the Hayabusa mission as proposed by the Japanese space agency, JAXA. The goal for Hayabusa 2 is to build upon the legacy of the original mission, by strengthening the shown weak points.

As of January 2011, the target is asteroid with a proposed launch in July 2014,

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27) http://en.wikipedia.org/wiki/SELENE
28) http://www.jaxa.jp/press/2007/11/20071107_kaguya_e.html
29) http://www.jspec.jaxa.jp/e/activity/humanlunar.html
30) ISRO also plans to undertake a manned spaceflight by 2014 and a manned mission to the moon by the year 2020; http://www.thedailystar.net/campus/2008/11/01/reflections.htm

with backup launch opportunities in December 2014, June and December 2015.

Hayabusa 2 would then be expected to [31]arrive to the target in 2018, survey the asteroid for a year and a half, depart in December 2019, and return to Earth in December 2020. The AKATSUKI (あかつき, 暁) is expected to usher in a new era of Venusian exploration. It was launched aboard an H-IIA Launch Vehicle No. 17 in May 2010 (JST.) It smoothly flew and spurted out jets from its orbit control engine on Dec. 7, 2010. AKASTUKI will elucidate the mysteries of Venus, Earth's twin sister.

Japan will initiate the beginning of a new era of Venusian exploration. AKATSUKI (PLANET-C) is the next planetary exploration project for Venus has long been referred to as Earth's sister planet not only because its size and distance from the sun are similar to those of the Earth, but also because its birth formation is considered to be similar to that of the Earth at the genesis period of the solar system. However, Venus is actually very different from the Earth as it is veiled in high-temperature carbon dioxide and thick sulfuric-acid clouds.[32]

JAXA is performing a manufacturing test of the bus and the scientific equipment for the Mercury Magnetosphereric Orbiter (MMO) flight model. BepiColombo will elucidate the mysteries of Mercury. BepiColombo is a Mercury exploration project jointly planned by Japan and the European Space Agency (ESA). The proximity of Mercury to the Sun makes it difficult to observe and hard to reach by space flight.[33]

The BepiColombo is a joint mission of the ESA and the JAXA to the planet Mercury.

The mission comprises two satellites to be launched together: the Mercury Planetary Orbiter (MPO) and the Mercury Magnetospheric Orbiter (MMO). The mission will perform a comprehensive study on Mercury, including its magnetic field, magnetosphere interior structure and surface. It is scheduled to launch in 9 July 2016. The mission was approved in February 2007 as part of the Cosmic Vision program. Arriving in

31) http://en.wikipedia.org/wiki/Hayabusa_2
32) http://global.jaxa.jp/projects/sat/planet_c/index.html?PHPSESSID=7e9c84288b4a591773675d4340d822f3
33) https://www.google.co.kr/?gfe_rd=cr&ei=1IAaU-L4B8SGmQX6hoG4Cg#newwindow=1&q=JAXA+Mercury

Mercury orbit in 1 January 2024, MMO and MPO satellites will then separate and observe Mercury in collaboration for 1 year, with a possible 1 year extension. The orbiters will be equipped with scientific instruments provided by various European countries and Japan.

6. India

Chandrayaan-1 has been built and had launched from Indian soil and sent on a mission to study the lunar surface. The Indian Space Research Organization (ISRO) will use its highly successful Polar Satellite Launch Vehicle (PSLV) to get the lunar probe into space. This is an impressive mission for a small space agency, making huge strides in the exploration of space.[34)]

In its fourteenth flight conducted from Satish Dhawan Space Centre (SDSC) SHAR, Sriharikota on October 22, 2008, the ISRO's Polar Satellite Launch Vehicle, PSLV-C11, successfully launched the 1,380kg Chandrayaan-1 spacecraft into a transfer orbit with a perigee (nearest point to Earth) of 255 km and an apogee (farthest point to Earth) of 22,860 km, inclined at an angle of 17.9 deg to the equator.

After a 52 hour count down, PSLV-C11 lifted off from the Second Launch Pad at SDSC SHAR at 06:22Hrs Indian Standard Time (IST) with the ignition of the core first stage.

The important flight events included the separation of the first stage, ignition of the second stage, separation of the payload fairing at about 116 km altitude after the vehicle had cleared the dense atmosphere, second stage separation, third stage ignition, third stage separation, fourth stage ignition and fourth stage cut-off.[35)]

Chandrayaan-1 is India's first spacecraft mission beyond Earth's orbit. With well-defined objectives, Chandrayaan-1 mission intends to put an unmanned spacecraft into an orbit around the moon and to perform remote sensing of our nearest celestial

34) http://www.universetoday.com/2008/08/17/india-has-big-plans-for-lunar-exploration
35) http://www.isro.org/pressrelease/Oct22_2008.htm

neighbor for about two years using eleven scientific instruments built in India and five other countries. The primary objectives of Chandrayaan-1are:

- To place an unmanned spacecraft in an orbit around the moon
- To conduct mineralogical and chemical mapping of the lunar surface
- To upgrade the technological base in the country

Chandrayaan-1 aims to achieve these well-defined objectives through high-resolution remote sensing of moon in the visible, near infrared, microwave and X-ray regions of the electro- magnetic spectrum. With this, preparation of a 3-dimensional atlas of the lunar surface and chemical and mineralogical mapping of entire lunar surface is envisaged. Chandrayaan-2, India's second mission to the Moon, will have an Orbiter and Lander-Rover module.

ISRO will have the prime responsibility for the Orbiter and Rover; Roskosmos, Russia will be responsible for Lander. Chandrayaan-2 will be launched on India's Geosynchronous Satellite Launch Vehicle (GSLV-MkII) around 2012-13 timeframe. The science goals of the mission are to further improve the understanding of the origin and evolution of the Moon using instruments onboard Orbiter and in-situ analysis of lunar samples using Lander and Rover.[36)]

The ISRO has also plans for sending a manned mission to space by 2014 and an astronaut to the moon by 2020.

India's Mars Orbiter Spacecraft crossed the half-way mark of its journey to the Red Planet along the designated helio-centric trajectory on April 9, 2014. Mars Orbiter Spacecraft was launched onboard PSLV-C25 on November 05, 2013. On December 01, 2013, Trans Mars Injection maneuver was conducted successfully and the Spacecraft was set in its course towards Planet Mars through a helio-centric trajectory. Soon after the Spacecraft crossed the sphere of influence of Earth, a Trajectory Correction Maneuver (TCM) was performed successfully on December 11, 2013. ISRO has been continuously monitoring the Spacecraft using its Deep Space Network complemented by that of NASA-JPL. As the Spacecraft is on its designated trajectory, the TCM planned

36) http://www.isro.org/scripts/futureprogramme.aspx#Human

for April 2014 is not considered essential. If required, the next TCM is planned to be carried out in June 2014.

At present, the radio distance between the Spacecraft and the Earth is 39 million km. A signal from the Earth to the Spacecraft and back to Earth takes 4 minutes and 15 seconds. Soon, the High Gain Antenna of the Spacecraft will be put in service for handling communications with the ground stations. The Mars Orbit Insertion (MOI) maneuver would be performed on September 24, 2014.

7. South Korea

In order to develop and acquire aerospace technology in timely and efficient manner, the Korea Aerospace Research Institute (KARI) has been collaborating with 34 organizations from 12 advanced countries such as the United States, Russia, UK, France, Germany, Israel, and China. Going forward, we will lay the foundation for a world-class aerospace research institute through increased joint researches and joint programs with leading aerospace research institutes.[37]South Korean government announced an ambitious plan on November 20, 2007 to join Asia's space race by launching a lunar orbiter by 2020 and sending an un-manned lunar probe to the moon five years after that.

According to the *"road map to the implementation of space development of the South Korea,"* developing its own 300-ton rocket is projected to require KRW 3.6 trillion (USD 3.9 billion) over the next decade. "South Korea will send an un-manned lunar probe into lunar orbit by 2020 and another to the surface of the moon by 2025 under the road map, "a ministry spokes person said.[38] Scientists from Korea recently unveiled a spacecraft developed completely in-house that could potentially be used for robotic exploration of the Moon.

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37) http://eng.kari.re.kr/sub04_07
38) http://www.kari.re.kr

The mini-sized lander, shown above is about 40 centimeters tall (15.5 inches) and weighs 25 kilograms (55lbs). Scientists say it carry an additional 20 kilograms in payloads to the surface. Every part of the rocket engine was "homemade," said Kwon Se-jin, a professor of aerospace engineering at the Korea Advanced Institute of Science and Technology (KAIST). The lander, the result of a six year long effort, represents an advancement in technology, and an important step for Korea's nascent space program. Also, the Korean team was proud of the low costs associated with their new lander. According to Prof. Dr. Kwon, lunar modules between the 100 and 200 kilogram range, developed by the under the International Lunar Network (ILN) project costs around $100 million.

The rocket engine created by his team could cut development costs to about half that, Prof. Dr. Kwon claimed. We have approached NASA over the possibilities of using our engine," Kwon said, adding that his team is collaborating with other local scientists with the goal of landing a spacecraft on the moon by 2013.[39] Korea's current plans are to launch an Earth-orbiting satellite in early 2009 from a newly built space port. If successfully, Korea would become the ninth country to launch a satellite from its own soil. But the Koreans also want to become part of an international space research project, the International Lunar Network (ILN)[40], a project aiming to gradually place six to eight fixed or mobile science stations on the lunar surface.

The stations will form a robotic network to replace the hardware left by the Apollo program to continue studies of the moon's surface and interior. On July 24, 2008 a meeting of the space agencies of Canada, France, Germany, India, Italy, Japan, the Republic of Korea, the United Kingdom, and the United States was held at NASA's Lunar Science Institute, located at the Ames Research Center. During the meeting, the representatives of the nine space agencies discussed about the cooperation on ILN and agreed on a statement of intent as a first step in planning.

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39) http://www.universetoday.com/21732/made-in-korea-lunar-lander-unveiled

40) The International Lunar Network or ILN is a proposed network of a series of landed stations of the United States and the other space-faring countries on the lunar surface in the 2010s.

A lunar base could be built from waterless concrete composed entirely of moon dust, according to the Korean researchers. Since regular concrete requires water, it is currently unlikely that conventional concrete structures will be built on the moon; however, this inventive idea might hold the key to future lunar settlements. Prof. Dr. Tai Sik Lee (Hanyang University at Seoul, Korea) had made the waterless lunar concrete for construction the lunar base in 2,012.[41] South Korea has been pushing an aggressive space program over the past decade, and objectives include having a man on the moon by 2020.

Ⅳ. Legal Problems and Solution for the Exploitation and Mining Rights of the Natural Resources in the Moon and Celestial Bodies

Recently it is most severe competition among the space superpowers in order to mine and exploit the natural resources including helium-3 from the moon so as to solve the serious problems of the earth's energy. As the Moon Agreement is un-ratified by any major space-faring powers and unsigned by most of them, it is of no direct relevance to current space activities. The space superpowers and private operators have not started to exploit the resources of the moon, Mars and other celestial bodies yet is the absence of rules setting out how this exploitation shall be carried out.

The space law system, indeed, does not provide any specific rule, relating to the exploitation of extraterrestrial resources, which have been generally accepted by States.

According to the 1967 Outer Space Treaty (OST)[42] and the 1979 Moon Agreemen

41) http://www.pisces.hawaii-conference.com/wp-content/uploads/2012/07/11.13.12_ Final_PISCES_ Ab stracts-2.pdf

42) The Outer Space Treaty, formally known as the *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial*

t[43], these two instruments does not offer an adequate legal framework which is able to ensure the safe, orderly and peaceful development and extraction from the natural resources of the Moon and other celestial bodies. On one side, the Outer Space Treaty does not contain any mention of space resources or to their possible exploitation.

On the other side, the Moon Agreement, whose main purpose is to set forth rules aimed at regulating the use for scientific and commercial reasons of lunar and other celestial bodies' materials, has been rejected by the majority of States, comprising the space-faring States.[44]

As a consequence, its principles lose relevance when applied to the exploitation of extraterrestrial resources. The major problem of the Treaty is that it does not contain any specific reference to space resources and to their exploitation. The exploitation of moon materials raises several specific legal issues, such as those related to the right of mining extraterrestrial sites or to property rights over the extracted materials, which may not be properly dealt with and solved by simply relying on the existing space law principles.

It is realistic to anticipate that the exploitation of these mineral resources will take place in a three phase process: ① pre mining phase; ② mining phase; ③ post mining phase.[45] The rules regulating the exploitation of the natural resources of the Moon and other celestial bodies should be inserted in a legal instrument which will be opened

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Bodies, is a treaty that forms the basis of international space law. The treaty was opened for signature in the United States, the United Kingdom, and the Soviet Union on January 27, 1967, and entered into force on October 10, 1967. As of May 2013, 102 countries are states-parties to the treaty, while another 26 have signed the treaty but have not yet completed ratification.

43) *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies,* (usually referred as Moon Agreement) signed on 18 December 1979; As of January 2013, only 15 states; Australia, Austria, Belgium, Chile, Kazakhstan, Lebanon, Mexico, Morocco, The Netherlands, Pakistan, Peru, Philippines, Saudi Arabia, Turkey and Uruguay, have ratified it. France, Guatemala, India and Romania have signed but have not ratified it.

44) The refusal of the developed States to ratify the Moon Agreement was largely due to the insertion of the Common Heritage of Mankind idea in Article XI of the Agreement declaring the Moon and its resources to be "the Common Heritage of Mankind", see C. Q. Christol, *"Important concepts for international law of outer space"*, in Proceedings of the Fortieth Colloquium on the Law of Outer Space, (1997), p. 73; F. G. von de Dunk, *"The dark side of the Moon: public concepts and private enterprises"*, in Proceedings of the Fortieth Colloquium on the Law of Outer Space, (1997), p. 121.

45) Fabio Tronchetti, *op.cit.*, pp. 133~144.

for acceptance by State and International Organizations. The International Space Exploitation Agency (ISEA) is the international organization through which States manage and control the exploitation of the natural resources of the Moon and other celestial bodies. The ISEA has the power to authorize persons to exploit for commercial purposes a certain lunar or other celestial bodies' area. At the same time, however, the ISEA has the duty to control that the exploitative activities are carried out in accordance with the space law principles and in a not detrimental manner for the space environment.

Ⅴ. Procedure of Establishing the ISEA

The ISEA is the international organization through which States manage and control the exploitation of the natural resources of the Moon and other celestial bodies. The establishment of ISEA as a new international regime is based on the Article 11, 5[46] and Article 18[47] of the 1979 Moon Agreement. In order to establish as a preliminary procedure, it needs to make the *Draft for the Convention on the Establishment of an ISEA* among the space-faring countries. This provision shall be implemented in accordance with article 18 of this Agreement. It is necessary for us to take the following five step's procedure in order to create an ISEA.

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46) Article 11, 5. States Parties to this Agreement hereby undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the moon as such exploitation is about to become feasible. This provision shall be implemented in accordance with article 18 of this Agreement.

47) Article 18 Ten years after the entry into force of this Agreement, the question of the review of the Agreement shall be included in the provisional agenda of the General Assembly of the United Nations in order to consider, in the light of past application of the Agreement, whether it requires revision. However, at any time after the Agreement has been in force for five years, the Secretary-General of the United Nations, as depository, shall, at the request of one third of the States Parties to the Agreement and with the concurrence of the majority of the States Parties, convene a conference of the States Parties to review this Agreement. A review conference shall also consider the question of the implementation of the provisions of article 11, paragraph 5, on the basis of the principle referred to in paragraph 1 of that article and taking into account in particular any relevant technological developments.

As a first step, it is necessary to hold a workshop, seminar or symposium of assembling by space law professors, lawyers, scientists, technicians, high-ranking officials and staff members from the global space agencies such as the UNCOPUOS, the United States (NASA), European Union (ESA), China (CNSA), Japan (JAXA), India (ISRO) and South Korea (KARI) etc. in order to concentrate on their opinions concerning the establishment of the ISEA.

As a second step, we need to organize a preparatory committee for establishing the ISEA through a ministerial conference or diplomatic conference of the space powers countries including delegate of the United Nations Committee on the Peaceful Use of Outer Space (UNCOPUOS).

As a third step, a "*Draft for the Convention on the Establishment of an International Space Exploitation Agency*" should be legislated by excellent space law professors, space scientists or diplomats in collaboration with specialists from the aforementioned Committee. As a fourth step, after extensive discussion and screening of the abovementioned *"Draft for the Convention"* by diplomatic conference in the UNCOPUOS, they must pass the said *"Draft for the Convention"* by the majority resolution of diplomatic conference in the UNCOPUOS.

As a fifth step, the UN member's countries would like to ratify "*The Convention for the Establishment of an International Space Agency.*" I would like to propose the following Preamble to the aforementioned *"Draft for the Convention,"* base on the International Space Exploitation Agency.[48)]

48) In 1975, European Space Conference, meeting in Brussels, approved the text of the *"Convention for the Establishment of a European Space Agency"* setting up the European Space Agency. The member states are now fifteen countries: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom. Canada is a Cooperating State: United Nations, *"Space Activities of the United Nations and International Organizations"*, UN (New York, 1992), p. 135; H.L. van Traa-Engelman, *"Commercial Utilization of Outer Space,"* Martinus Nijhoff Publishers (1993), pp.160-161.

Preamble of the Draft for the Convention on the Establishment of an International Space Exploitation Agency;

The States Parties to this Agreement,

Recognizing the common interest of all mankind in the progress of the exploration and use of outer space for peaceful purposes,

Determined to promote on the basis of equality the further development of co-operation among States in the exploration and use of the moon and other celestial bodies,

Desiring to contribute to broad international co-operation in the scientific as well as the legal aspects of the exploration and use of the moon and other celestial bodies for peaceful purposes,

Desiring to prevent the moon and other celestial bodies from becoming an area of international conflicts and environmental damage,

Bearing in mind the benefits which may be derived from the exploitation of the natural resources of the moon and other celestial bodies,

Recalling the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, the Convention on International Liability for Damage Caused by Space Objects, and the Convention on Registration of Objects Launched into Outer Space,

Taking into account the need to define and develop the provisions of these international instruments in relation to the moon and other celestial bodies, having regard to further progress in the exploration and use of the moon and outer space.

Ⅵ. The Principal Items that Need to be Included in the Draft for the Convention

I would like also to propose the following ten principal points that need to be included in the said *"Draft for the Convention.*

1. Purpose of Creation

The purpose of establishing the ISEA is to provide for and to promote, for exclusively peaceful purposes, cooperation among the global States in space research and technology and their space application for the moon and other celestial bodies, with a view to their being used for scientific purposes and for operational space applications systems.

The purposes of the ISEA shall include in particular:

- Drawing up international rules and monitoring the application of such rules, including the gathering of technical information on space activities conducted under existing legal texts (license, registration, recovery liability, satellites with nuclear power resources etc.) or future texts (space shuttle, space station, space debris, etc.);
- Encouraging the transfer of space technologies to developing countries, the training of specialists, and wide circulation of data gathered in the course of space activities, especially data adapted to the needs of these countries (for ex: distribution of remote sensing data);
- Coordinating environmental monitoring by satellites and spacecraft
- Establishing a monitoring and researching organization in order to protect the environment of earth and space so as to mitigate space debris.

2. Members and Legal Personality

The members of ISEA shall be the States parties to the *"Convention for the Establishment of an International Space Exploitation Agency."* The ISEA shall have legal personality. The ISEA may exercise also its functions and powers, as provided in this Statute, on the territory of any State Party and, by special agreement, on the territory of any other State. It shall also have such legal capacity as may be necessary for the exercise of its functions and the fulfillment of its purposes.

3. Space Policy

The ISEA is in charge of elaborating and implementing the medium and long-term global space policy of actual activities and programs and a related industrial policy in the space field, and the coordination of UN member's states and their national space programs with respect to international organizations and institutes. Furthermore, the member States decide on global assimilation of their national space programs by integrating them into the ISEA programs. Finally, the ISEA elaborates and implements a space industrial policy, which is designed, in particular, to improve the exploitation and developments of the global space industry for the moon and other celestial bodies.

4. License for Mining Right

The license to carry out the exploitation of the natural resources of the moon, mars or other celestial bodies' site is a contract between the ISEA and the licensee. The license will contain: ① a declaration of the licensee accepting the space law principles and the rules of the present legal regime and affirming his duty to operate in good faith; ② the indication of the geographical location of the extraterrestrial site object of the license; ③ the schedule of the activities to be undertaken on the lunar site.

The ISEA, by means of the Council, has the duty to control the operator of the licensee[49]. In case such a control shows that licensee has not respected the terms of the license, the Council of ISEA would ask the licensee to stop these violations and to take the required measures. The license would be given for a maximum period of twenty years. This is an essential for ensuring the compliance of the legal regime regulating the exploitation of extraterrestrial resources with the non appropriative nature of outer space sets out. The obtainments of the license will be subject to the payment of an initial fee.

The licensee will have also to pay a fee every two years. Additionally, in case he does not comply with certain terms of the license a fine can be imposed. The licensee enjoys two rights for the whole duration of the license: the rights of continued use over the area object of the license and the right to exercise property right over the extracted materials and the benefits generated thereof. Property rights over the extracted resources are necessary in order to provide the licensee with a reward for the effort they made to explore and exploit a lunar site and to make such exploitation a profitable business.

5. Exchange of Information

Members and the ISEA shall facilitate the exchange for information of space policy, programs as well as scientific and technical information pertaining to the fields of space technology for the moon, Mars, Venus, Mercury and other celestial bodies.

49) The Council will have two ways to verify if the licensee is operating in accordance with the license: 1) through a report which every license is obliged to provide on an annual basis containing information on the activities which have been undertaken; 2) through a manned mission which can check in loci the status of the exploitative activities. The Council should give the licensee one month notice before undertaking the control. The licensee shall offer proper collaboration and provide information during the control.

6. Education and Research

The ISEA shall ensure the execution of basic activities, such as education (astronauts etc.), documentation, studies of future projects and technological research work. The ISEA also facilitates the collection of relevant information and its dissemination to Member States, assistance and advice for harmonizing national and international programs and the elaboration and execution of scientific programs including the design, development, construction, launching, placing satellites and space shuttle in orbit and control of satellites and all similar activities for launching facilities, moon station, airport or space transport system from the earth to the moon, mars and other celestial bodies.

7. International Cooperation

The ISEA may, upon decisions of the Council taken by vote of a majority of all Members States, cooperate with other international organizations and institutions and with Governments, organizations and institutions of non-Member States, and conclude agreements with them to this effect.

8. Financial Contributions

The ISEA will be financed by its member States. The scale of contributions shall be based on the average national income of each Member State for the three latest years for which statistics are available.

9. Raising and Accumulating Funds

According to Article 11, (7), (d) of the 1979 Moon Agreement, the ISEA must raise and accumulate the funds for the equitable sharing by all States Parties in the

benefits derived from those resources, whereby the interests and needs of the developing countries, as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the moon, mars and other celestial bodies shall be given special consideration.

10. Organs

An organization to be named the International Space Exploitation Agency is formed by the Convention. It is made up of a General Assembly, a Council, a Director General, a Senior Staff and such other bodies as may be necessary.

(1) The General Assembly

- The participation in the works of the General Assembly is, indeed, open to all States which have accepted the present legal regime and which are member of UNCOPUOS.
- The General Assembly, which is the principal organ, is composed of representatives of all Member States.
- The Assembly shall meet annually and shall be convened by the Council at a suitable time and place. Extraordinary meetings of the Assembly may be held at any time upon the call of the Council or at the request of any ten contracting States addressed to the Secretary General.
- It meets when it is required and is composed of either Ministers of the Member's States or government delegates. When it meets at ministerial level it can fulfill the political and practical function for the international conference on the exploitation and development of the moon, mars and other celestial bodies.
- The General Assembly elects its chairman and its vice-chairman for a period of three years, and re-election is possible for a further year.
- The Chairman shall direct the meetings, the proceedings, prepare the decisions and maintain appropriate contact with the Member States; he shall advice the

Director General and obtain from him all necessary information.

- When the Council meets at the ministerial level, it shall elect a chairman for that meeting.

(2) The Council

- The Council shall be a permanent body responsible to the Assembly. It shall be composed of thirty six contracting States elected by the Assembly. An election shall be held at the first meeting of the Assembly and thereafter every three years, and the members of the Council so elected shall hold office until the next following election.
- The Council shall elect its President for a term of three years. He may be reelected. He shall have no vote. The Council shall elect from among its members one or more Vice Presidents who shall retain their right to vote when serving as acting President. The President need not be selected from among the representatives of the members of the Council but, if a representative is elected, his seat shall be deemed vacant and it shall be filled by the State which he represented.
- Its functions and powers represent the core of the system including license regulating the exploitation of the mineral resources of the moon, mars and other celestial bodies.

(3) Director General

- The Director General is the executive of the ISEA and its representative.
- The Director General, who is the head of the executive body, is appointed by a two-thirds majority of all Member States.
- He is responsible for the management of the ISEA, the execution of the programs and he accomplishes all the tasks imposed on him by the Council as well as the implementation of its policy and the attainment of its objectives in accordance with the ISEA Convention.

(4) Senior Staff

Members of Senior staff for management, defined by the Council, shall be appointed by the Council on the recommendation of the Director General.

11. Disputes and Arbitration

Disputes between Member States or between any of them and the ISEA must first be settled by the Council. If the dispute is not settled by the Council, it may request the arbitration so as to solve the disputes among the Member States. Unless the Member States agree differently or the Council adopts other rules, the Arbitration Tribunal shall consist of three members. Each Party shall appoint one of them, and those two arbitrators shall designate a third member. The third member is the umpire and presides over the tribunal.[50] The rules of procedure may be agreed between the Parties or imposed by the Council. The award shall be decided by the majority of votes (abstentions are not allowed) and it is final and binding.

12. Headquarters

The permanent seat of the ISEA shall be determined by the resolution of the final meeting of UNCOPUOS. As the headquarters of the International Court of Justice and the International Criminal Court are located at The Hague (The Netherlands) and the headquarter of the International Tribunal for the Law of the Sea is located in Hamburg (Germany), already three International Court's headquarters are all located in Europe. So, it has to be taken into account that Europe's 710 million people only make up 11% of the world's population but Asia accounts for over 60% of the world population with almost 3.8 billion people.[51] Therefore as it should be adequate to decide on locating the ISEA headquarter in the Asian Pacific region, so it is desirable

50) E. R. C. Van Bogaert, *"Aspects of Space Law"*, Kluwer, (1986), p. 271.
51) http://en.wikipedia.org/wiki/World_population

for us that Seoul (Korea) or Hong Kong (China) etc. will be decided as an ISEA headquarter in the near future.

Ⅶ. Conclusion

The ISEA will be regarded as a new road for the global space policy and exploitation of the moon, mars, venus, Mercury and other celestial bodies in the global community.

The ISEA also coordinates the broad thinking needed to meet new challenges in the global countries. The ISEA will provide a bright prospects and vision of the world community's future in the moon, mars, venus, Mercury and other celestial bodies, and for the benefits of the mankind on the ground that satellites and spacecraft can supply. Due to the developments of internet, telecommunication and high technology by the satellites, spacecrafts and international space stations, it will be extinguished gradually or step by step the boundary among the global countries.[52)]

It is necessary for us to establish the ISEA so as to work together in union, to strengthen cooperation in research, and to establish friendly relations for the benefit of the mankind in the field of space exploitation.

Finally, a very important point is that a political drive, at the highest level, should be given to mobilize states to this initiative, possibly taking the form of a solemn statement by heads of the space superpower's countries setting out objectives and prospects for the long term. It should be noted that this political drive will be necessary not only to set up the organization, but also during a subsequent period.[53)]

It is desirable for us to establish the ISEA in order to exploit and mine efficiently the natural resources of moon, mars, venus, Mercury and other celestial bodies.

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52) *"Wissenschaft und Kunst gehören der Welt an, und vor ihnen verschwinden der Schranken der Nationalität,"* Poem by Johann Wolfgang von Goethe, Hans Wüstendörfer, *"Neuzeitliches Seehandelsrecht,"* Verlag J.C.B. Mohr (1950), Tübingen, Germany, p. 17.

53) Gabriel Lafferranderie, *"Outlook on Space Law over the next 30 years"*, Essays Published for the 30th Anniversary of the Outer Space Treaty, Kluwer Law International (1997), p. 427.

I am sure that it is possible to establish the ISEA in the near future, if the heads of the space super powers would agree to establish the ISEA through a summit conference and the diplomatic conference of UNCOPUOS.

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Abstract

Proposal on the Creation of a New Space Organization for the Moon and Celestial Bodies' Exploitation

Doo Hwan Kim

The idea of creating an International Space Exploitation Agency (tentative title: hereinafter referred to ISEA) is only my academic and theoretical opinion. It is necessary for us to establish ISEA as an international organization for the efficient and rapid exploitation of natural resources in the moon and other celestial bodies.

The creation of ISEA as a new international organization is based on the Article 11, 5 and Article 18 of the 1979 Moon Agreement. In order to create it as a preliminary procedure, it needs to make *the Draft for the Convention on the Establishment an ISEA* among the space-faring countries.

The main contents of this paper is composed of ① introduction, ② joint exploitation of the natural resources (Heliumn-3, etc.) in the moon and ISEA, ③ activities for the exploitation of moon and other celestial bodies by the space-faring powers, ④ legal problems and Solution for the exploitation and mining rights of the natural resources in the moon, mars and celestial bodies, ⑤ procedure of creating an ISEA, ⑥ the principal points that need to be included in the draft for the ISEA convention, ⑦ conclusion.

The creation of an ISEA would lead to a strengthening of the cooperation among the States deemed essential by the global community towards joint undertakings in space and would act as a catalyst for the efforts on the exploitation of the natural resources moon, mars, Venus, Mercury and other celestial bodies and allow resources, technology, manpower and finances to be centrally managed in an independent fashion to the benefit of the space-faring countries. It is desirable and necessary for us to create ISEA in order to promote cooperation in the field of space policy, law, science

technology and industry etc. among the space-faring countries.

The creation of the ISEA will be promoted the international cooperation among the space-faring countries in exploration and exploitations of the natural resources in the moon, Mars, Venus, Mercury and other celestial bodies.

Finally, it should be noted that the political drive will be necessary not only to set up the organization ISEA, but also study a subsequent measures. It is also necessary for us to create the ISEA in order to develop the space industry, to strengthen friendly relations and to promote research cooperation among the space-faring countries based on the new ideology and creative ideas. If the heads (president or prime minister) of the space super-powers including the UNCOPUOS will be agreed to establish ISEA at a summit conference, 1 believe that it is possible to establish an ISEA in the near future.

Key Words : ISES, Heliumn-3, Draft for Convention, Mining Rights, Moon, Mars, Venus, Mercury and Celestial Bodies, NASA, ESA, RKA, CNSA, JAXA, ISRO, KARI, Moon Agreement of 1979

초 록

달과 천체 개발을 위한 새로운 우주기구의 창설에 관한 제안

김두환 *

국제우주개발기구 (가칭: 이하 ISEA이라고 호칭함)를 창설하는 아이디어는 오로지 필자의 학문적이고 이론적인 의견입니다. 우리는 달, 화성, 금성, 수성 등과 기타 천체에 있는 천연 자원을 효율적이고 신속히 개발하기 위하여 새로운 국제우주개발기구의 창설이 필요하다. 새로운 국제기구로 ISEA의 창설은 1979 년의 달 협정 제18조 및 제11조 5항에 법적인 근거를 두고 있다. ISEA를 창설하기 위한 사전절차로서 우주관계 강대국들 간에 ISEA창설에 관한 국제조약 초안의 제정이 우선 필요하다고 본다.

이 논문의 주된 내용은 ① 서론, ② 달 내에 있는 천연자원 (heliumn-3 등)의 공동개발, ③ 우주강대국들에 의한 달과 화성, 금성, 수성 및 다른 천체의 개발을 위한 활동, ④ 달과 화성 및 다른 천체 내에 있는 천연자원에 대한 개발과 채굴권(광업권)에 관한 법적인 문제점과 해결방안, ⑤ ISEA에 관한 5단계의 설립절차, ⑥ ISEA의 설립에 관계된 국제조약초안에 포함되어야만 할 주된 12개 항목(조항), ⑦ 결론 등으로 구성되어 있다.

ISEA의 창설은 우주공동개발을 위하여 국제사회에서 필수적으로 요구되고 있는 협력강화로 이어질 것이며 달, 화성, 금성, 수성 및 다른 천체의 천연자원의 개발에 촉매적인 역할을 하게 되고 또한 우주강국들의 이익을 위하여 자원, 기술, 인력, 금융 등을 독립형태로 중앙 집중적으로 관리 할 수가 있다.

우주강대국들 간에 우주정책, 법, 과학, 기술 및 산업 등의 분야에서 협력증진을 위하여 ISEA의 설립은 우리들에게 꼭 필요하며 바람직한 일이다. 더욱이 ISEA의 창설은 달, 화성, 금성, 수성 및 다른 천체의 천연자원의 탐험과 개발을 함에 있어 국제협력이 더욱 필요하게 될 것이다.

마지막으로, ISEA의 기구를 설립하는 데는 정치적이 추진력이 필요할 뿐만 아니라

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이에 관한 후속조치도 강구되어만 한다는 것을 유념하여야만 된다. 새로운 이념과 창의력 을 가지고 우주산업을 발전시키고 우주국들 간에 우호관계를 증진·강화시키기 위하여 반듯이 ISEA의 창설이 필요하다고 본다. 만약 UN의 우주평화적 이용위원회를 포함한 우주강대국들의 내각 수반(대통령 또는 국무총리)들이 정상회담에서 ISEA의 설립에 합의한다면 가까운 장래에 ISEA의 설립은 가능하다고 필자는 확신하고 있다.

주제어 : 국제유럽우주국우주개발기구, 헬리움-3, 조약초안, 광업권, 달, 화성 및 금성, 수성과 천체, 미국항공우주국, 유럽우주국, 러시아연방우주청, 중국국가우주청, 일본우주항공연구개발기구, 인도우주연구기구, 한국항공우주연구원, 1979년의 달 협정