

The Potential Commercialization of China's Space Station and Its Relevance to Space Law

Jie Long*

Abstract

According to the China Manned Space Agency (CMSA), China is targeting the early 2020s for the orbiting of its permanent space station – CSS, which is consisted of several modules but smaller than the International Space Station. The CSS will enable China as the third country that has independently constructed and operated a space station, and provide a golden opportunity for the international space cooperation and commercialization of China's long-term space project. In this article, the possible commercial utilizations of the CSS will be introduced and corresponding international space law will be discussed. Specifically, the principles of common interests and space cooperation will be examined in the background of the commercialization of the CSS and possible solutions for upgrading the existing space law regime and maintaining the sustainable development of the CSS will also be raised throughout this article.

1. Introduction and Background

1.1. Commercial Utilizations of Manned Space Stations

Throughout the evolution of human space activities, manned space stations are among one of the most significant achievements in outer space. These large space objects comprise several components that contain numerous cutting-edge types of technologies and involve large amounts of capital investment. Space station commercialization originated from the Mir and continued with the ISS.¹ The very first endeavor of utilizing the Mir as a platform for commercial activities was conducted by MirCorp, a US based corporation established in 1999.² Although this pioneering commercial

* The University of Hong Kong, longjie@hku.hk.

1 Stella Tkatchova, 'Space Station Commercialization' in Stella Tkatchova (eds), *Space-Based Technologies and Commercialized Development: Economic Implications and Benefits* (Engineering Science Reference 2011) 60.

2 Ibid, at 59-64. MirCorp signed a commercial agreement with the USSR in terms of the commercialization of the Mir in 1999, the first privately funded human space

attempt ended with the de-orbiting of the Mir in 2001, it paved the way for the commercialization of the ISS, and enabled space-based technologies and applications to find their ideal platform for commercial utilization.³

The targeted customers of the ISS were pharmaceutical companies, medical device developers or automotive companies because their initial research required technology from metallurgy and robotics to cell biology and pharmaceutical drug design. To further encourage commercialization opportunities, the ISS facilities were offered for research use in the areas of biotechnology, innovative materials, and basic life and fluid physics sciences.⁴ Owing to the orbital position of the ISS in outer space, their signal transmission services and high temperature superconducting telecommunications equipment were promising areas where private commercial ventures could invest a large amount of capital.⁵

As the operations of the ISS has reached its final planned decade of operation,⁶ the relatively short left lifespan left of the ISS means that it is optimistic and promising for the CSS to attract more international cooperation and commercial opportunities.⁷ Traditional space commercialization mainly includes satellite-related civil services, such as telecommunication, broadcasting, remote sensing, meteorology and launching. Nowadays, commercial activities have expanded with the wide participation of private entities. The success of the commercialization of the ISS has encouraged the development of new markets, the first space tourists

mission to Mir and it enabled Dennis Tito to become the first space tourist for one-week flight to Mir in 2000; Moreover, in 1999, the Mir also attracted Pizza Hut to pay around \$1 Million to have their logo on-board the Proton launcher, this commercial branding activity also continued to be applied to the ISS in 2001. Furthermore, Segei Zaletin's and Alexander Kareli's space flight to the Mir were also sponsored by MirCorp.

- 3 W. Kroll and H.W. Ripken, 'Keynote Address: ISS: From Political to Scientific and Economic Preeminence' in G. Haskell and M. Rycroft (eds), *International Space Station: The Next Space Marketplace* (Springer Science & Business Media 2000) 1; Stella Tkatchova, 'Space Station Commercialization' (n 1) 63. Six ISS commercial areas were identified in W. Kroll's Keynote Address: Technology testbed; research, both public and private; observational activities, e.g. Earth observations; operations, logistics and commercial services; education and outreach; free market elements, such as advertising.
- 4 Tkatchova, 'Space Station Commercialization' (n 1) 64.
- 5 Kroll and Ripken, 'Keynote Address: ISS: From Political to Scientific and Economic Preeminence' (n 3) 6.
- 6 'Sec. 13. Operation and Utilization of the ISS, S.1297 – U.S. Commercial Space Launch Competitiveness Act', (*US Congress.gov*, 4 August 2015) <<https://www.congress.gov/114/bills/s/1297/BILLS-114s1297es.pdf>> accessed 26 May 2016.
- 7 Foust J, 'The Role of International Cooperation in China's Space Station plans' (*The Space Review*, 13 October 2014) <<http://www.thespacereview.com/article/2615/1>> accessed 26 May 2016.

to visit the ISS and development of new industrial applications.⁸ Therefore, a commercial trend could be foreseen for the exploitation of natural resources in space, space material production, space breeding and space transportation which could all become reality in the near future.⁹ These space commercialization activities could also be closely related to the CSS.

According to the latest information provided by the CMSA in the 67th International Astronautical Congress held in Mexico, the official confirmed that international cooperation will be allowed in the CSS in the areas of jointly developing the station platform, flying experiments by scientists from other countries, selecting and training astronauts, and promoting existing human space technology.¹⁰ It could be inferred that these activities related with the CSS could also be conducted in a commercial way with the participation of governments or private entities of different countries at different levels and even international organizations.

1.2. Relevance of CSS Commercialization to Space Law

In the official report of the CMSA, it was announced that the cooperation within the CSS should peacefully contribute to the sustainable development of Earth planet and each country should cooperate in a reciprocal way, thus achieving further and long-term development in human space exploration after the forthcoming accomplishment of the present three-step strategy of China's manned space program.¹¹ Though space law was not mentioned in the CMSA report, the principles raised were matched with the fundamental principles for human space activities set up by the OST,¹² namely the principles of peaceful use of outer space, common interests of humankind and space cooperation. These space principles were closely related with the commercialization of the CSS, the application of these principles in the new space era would decide whether large space projects could be developed in a sustainable way.

There are two primary characteristics of space commercialization in the existing international law framework. First, due to the nature of the space regulatory framework in public international law, the traditional bodies who can amend space law are sovereign states and intergovernmental

8 Stella Tkatchova, *Space-Based Technologies and Commercialized Development: Economic Implications and Benefits* (Engineering Science Reference 2011) 75-76.

9 Ibid, at 1, 30, 164.

10 Zhonggui Wang, 'Keynote Address: China's Manned Space Program and Opportunity for Cooperation', China Manned Space Agency, GNF, the 67th International Astronautical Congress, Guadalajara, Mexico, 30 September 2016. <http://www.cmse.gov.cn/art/2016/10/11/art_19_31164.html> accessed 20 October 2016.

11 Wang, 'Keynote Address: China's Manned Space Program and Opportunity for Cooperation' (n 10).

12 The principles raised in the section of International Cooperation of the CMSA report include: peaceful use of outer space, equality and mutual benefit, equality and mutual benefit and joint development.

international organizations.¹³ However, the potentially significant commercial interests of space activities have attracted a variety of participants, including states, intergovernmental and nongovernmental organizations, and private entities,¹⁴ which has posed challenges to the traditional legal regime.¹⁵ Second, in contrast with the nature of the public interest orientation of the current space law regime, commercialization is developing in parallel with space privatization, and the pursuit of private interests is becoming increasingly obvious,¹⁶ such as the private sector who claim the protection of intellectual property as their exclusive right.¹⁷

In the long run, especially considering the development of large space projects like the CSS, the current space law regime, which originated from the Cold War era, needs further examination in light of the characteristics of space commercialization. The following questions could reflect the relevance of CSS commercialization to space law to a large extent: Are the relevant provisions of current space treaties sufficient enough to regulate emerging commercial space activities? Is it possible to reconcile the public nature of the basic space principles established by the OST with the private nature of commercial space activities? How should space rules be implemented for specific commercial space activities and what legal aspects need to be addressed in order to meet the needs of future space development? These questions would not only determine the future development of space law but also decide how successful CSS commercialization could be.

2. International Space Principles and CSS Commercialization

2.1. Common Interests Principle and CSS Commercialization

The basic configuration of the CSS involves Core Module, Experiments Module-I, and Experiment Module-II, which are symmetrically T-shaped. The three modules of CSS will be featured with advanced technologies and equipped with multi-purpose facilities in international standards for space

13 Wayne White, 'The Legal Regime for Private Activities in Outer Space' (*Space Future.com*) <http://www.spacefuture.com/archive/the_legal_regime_for_private_activities_in_outer_space.shtml> accessed 14 May 2016.

14 Peter Malanzuk, 'Actors: States, International Organizations, Private Entities' in Gabriel Lafferranderie and Daphne Crowther (eds), *Outlook on Space Law over the Next 30 Years* (Springer 1997) 28-29; Jeff Foust, 'The Evolving Ecosystem of NewSpace' (*The Space Review*, 15 August 2011) <<http://www.thespacereview.com/article/1906/1>> accessed 14 May 2016.

15 PJ Blount, 'Renovating Space: The Future of International Space Law' (2012) 40 *Denver Journal of International Law & Policy* 515, 523.

16 José Monserrat Filho, 'On Private, States and International Public Interests in Space Law' (1996) 12 *Space Policy* 59, 59.

17 Ruwantissa Abeyratne, 'The Application of Intellectual Property Rights to Outer Space Activities' (2003) 29 *Journal of Space Law* 1, 20.

science.¹⁸ These space science experiments have a great potential to be commercialized with the participation of other countries. Encouraging more governmental and non-governmental entities to participate in these commercial space activities and meanwhile achieving the sustainable development of the CSS has become an issue that needs to be resolved in the new space era.

In the current space law framework, the OST has established the fundamental principles for the space activities of human beings.¹⁹ Since these principles have an obvious public nature, and the objective of private entities is mainly for commercial profit, it thus becomes necessary to examine the compatibility between the space law principles and commercial space activities. Based on the proposition that these basic space principles are adaptable to the new changes in space activities, the issue of formulating a mechanism to balance public and private interests is the one of the ultimate purposes for both international space law revisions and national space legislation.²⁰ In this section, the fundamental space principle, the principles of “common interests”, which is most relevant to the commercialization of CSS will be introduced and discussed.

The common interests principle was outlined in both Preamble (3) and Article 1 (1) of the OST in 1967. This principle established the basic obligatory requirement of space-faring countries, namely, to use and explore outer space for the benefit and interests of all nations as the prior consideration for space activities. However, the emerging commercial space activities now have the purpose of attaining private interests. Is it possible that these activities could be smoothly conducted in complying with this common interests principle?²¹ Particularly, could these commercial activities related with the CSS bring benefits to both the public and private entities? To

18 These CSS space science experiments include: Space life sciences and biotechnology, Microgravity fluid physics & combustion, Material science in space, Fundamental Physics in Microgravity and Multipurpose Facilities.

19 As space law is a branch of public international law, outer space activities shall also be conducted in accordance with the basic principles established by the Charter of the United Nations, such as principle of equality and mutual benefit, respecting national sovereignty, mutual non-aggression, national self-determination, and peaceful settlement of disputes. Moreover, as activities conducted in outer space have their own characteristics, the principles established in the space law shall also be followed, these principles include: objective of common interests, free exploration and use, non-appropriation, peaceful purposes, international responsibility, space cooperation, environmental protection, rescue and registration. These space principles were first proposed in the 1963 Outer Space Declaration and then confirmed and developed in the 1967 OST.

20 David Tan, ‘Towards a New Regime for the Protection of Outer Space as the Province of All Mankind’ (2000) 25 *Yale Journal of International Law* 145, 193.

21 Arthur M Dula, ‘Regulation of Private Commercial Space Activities’ (1983) 23 *Jurimetrics Journal* 156, 188.

answer this question, it is necessary to examine the essence of “common interests”, which includes examining the legal effect and specific contents of “common interests” principle.

Although the legal status of the “common interests” principle has been acknowledged by the international community, there is a dilemma in its implementation in commercial space utilization practices.²² Currently, there is neither international nor domestic legal instruments that specifically elaborate on the means to achieve the common interests of all countries. This means that there is no clear definition of “common interests” yet, and no answer for the question of the measures that should be taken in commercial space activities to fulfil the treaty obligation of a country under the OST.

A possible solution for the above dilemma is the use of the concept of “common heritage of mankind” as proposed in the Moon Treaty.²³ This concept further provides that the moon and its natural resources are the common heritage of humans; however, when the exploitation of the natural resources of the moon is about to be realized, there is no concrete governing mechanism in the Moon Treaty for resource exploitation and benefit distribution.²⁴ The concept of “common heritage of mankind” is just an initial attempt to resolve the issue. With the possibility of commercial use of the CSS, the problem of absent in the critical ingredient of meeting the common interests of all countries should be resolved in the future.²⁵

2.2. Space Cooperation Principle and CSS Commercialization

In 1961, the United Nations General Assembly (UNGA) Resolutions emphasized the importance of “international cooperation” for the first time.²⁶ In 1963, international cooperation was indicated as one of the most

22 I. H. Ph. Diederiks-Verschoor, ‘Implications of Commercial Activities in Outer Space, Especially for the Developing Countries’ (1989) 17 *Journal of Space Law* 115, 117.

23 Article 11 (1) of the Moon Treaty provides that, ‘The Moon and its natural resources are the common heritage of mankind, which finds its expression in the provisions of this Agreement, in particular in paragraph 5 of this article.’

24 Article 11 (5) of the Moon Treaty provides that, ‘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.’ For the prediction and analysis of such governing regime, see: Fabio Tronchetti, *The Exploitation of Natural Resources of the Moon and Other Celestial Bodies: A Proposal for a Legal Regime*, vol 4 (Studies in Space Law, Martinus Nijhoff Publishers 2009) 233-285; Yuhai Yin, et al. *Research on International Legal Issues in Lunar Exploration and Development* (China Democracy and Legal Press 2013) 223-244.

25 Brian M Hoffstadt, ‘Moving the Heavens: Lunar Mining and the Common Heritage of Mankind in the Moon’ (1994) 42 *Treaty UCLA Law Review* 575, 612-13.

26 See: ‘International Cooperation in the Peaceful Uses of Outer Space’, UNGA Resolution 1721 A and B (XVI) (20 December 1961).

important principles for space activities.²⁷ This principle was further reinforced in the 1967 OST and has been since universally accepted by the international community.²⁸ In 1996, the UNGA resolution emphasized again on space cooperation.²⁹

China also fully respects the international space cooperation principle. According to the CMSA, the CSS will be allowed for international cooperation in various areas.³⁰ One typical example of space cooperation between the China and international community in terms of the CSS is that CMSA and the United Nations Office for Outer Space Affairs (UNOOSA) have signed the Framework Agreement and the Funding Agreement concerning cooperation on the utilization of the CSS.³¹ Under the framework of the agreements, the both parties will work together to provide United Nations Member States with opportunities to fly their space experiments, their astronauts and/or payload engineers on board the CSS. Both parties will also facilitate international cooperation in human space flight and other potential space activities, increased awareness of the benefits of human space technology and its applications, and capacity-building activities in space technology.³² The CMSA-UNOOSA agreement also opens doors for further transnational cooperation on commercial space activities and offers valuable experiences in conducting space cooperation.

27 See: 'Declaration of Legal Principles Governing the Activities of States in the Exploration and Uses of Outer Space', UNGA Resolution 1962 (XVIII) (13 December 1963).

28 Article 1 (3) of the OST provides that, 'There shall be freedom of scientific investigation in outer space, including the Moon and other celestial bodies, and States shall facilitate and encourage international cooperation in such investigation.'; Article 3 of the OST provides that, 'States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the Moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding.'; Article 9 of the OST provides that, 'In the exploration and use of outer space, including the Moon and other celestial bodies, States Parties to the Treaty shall be guided by the principle of cooperation...'

29 See: 'Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries (Space Declaration)' UNGA Resolution 51/122 (13 December 13 1996).

30 Wang, 'Keynote Address: China's Manned Space Program and Opportunity for Cooperation' (n 10).

31 UN Members Permitted to Use China's Manned Space Station, (*People's Daily Online*, 29 July 2016) <<http://en.people.cn/n3/2016/0729/c90000-9092779.html>> accessed 23 August 2016.

32 United Nations and China Agree to Increased Space Cooperation, (*Unis*, 16 June 2016) <<http://www.unis.unvienna.org/unis/en/pressrels/2016/unisos468.html>> accessed 23 June 2016.

By taking the critical space principle into account, in the CSS project, it could be concluded that China will maximize their national interests while assuming the obligations of international law. According to the theory of international relations, the intentions of countries that participate in international cooperation may be complicated, as various factors, such as politics, economy, culture, national security and diplomacy are taken into consideration before and during the cooperation. Therefore, the cooperation usually involves competition.³³ It can be concluded that space cooperation is even more challenging than traditional types of cooperation on earth, and the US-USSR (Russia) space cooperation during and after the Cold War is a typical example. Thus, China is supposed to seek common grounds in space cooperation, namely with respect to national interests, and address differences by balancing the different interests of their partners.³⁴ From the experiences of the Mir and ISS, it can be concluded that international space cooperation is a necessary means for the success of a long-term and effective space project. If the impending CSS project want to achieve sustainable development, it is suggested that a pragmatic approach is adopted towards international space cooperation in the process of commercial cooperation in space with various participants from different countries, regardless of the political and ideological differences.

3. International Space Treaties and Commercialization of CSS

The commercialization of the CSS means that private entities would possibly participate in the operation of the project. Private engagement means that private enterprises participate in space activities in the same way as the governmental entities, even though these private and other non-governmental entities cannot be the subject of public international space law. The legality of such private engagements can be justified in the second sentence of Article 6 of the OST which provides that:

“The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty.”

This article is the legal basis for private participation in outer space.³⁵ More specifically, non-governmental entities, including private enterprises, have the

33 Xinning Song, ‘Building International Relations Theory with Chinese Characteristics’ (2001) 10 *Journal of Contemporary China* 61, 61-74.

34 Xiaodan Wu and Haifeng Zhao, ‘An Analysis of International Cooperation in China’s Manned Space Flights’ (2013) 15 *Journal of Beijing Institute of Technology (Social Science Edition)* 96, 96-102.

35 Michael Gerhard, ‘Article VI in Hobe S and others (eds), *Cologne Commentary on Space Law: Outer Space Treaty*, vol 1 (Carl Heymanns Verlag 2009) 117.

right to carry out space activities, provided that two conditions are satisfied: (1) the space activities of non-governmental entities are authorized and continuously supervised by the appropriate state party to the OST,³⁶ and (2) the state parties bear international responsibility for the activities conducted by non-governmental entities.³⁷ Therefore, the legal status of private enterprises in outer space is acknowledged only if their corresponding state has performed the obligations as stipulated in this article.

Based on the conclusion that commercial space activities are permitted and the legal status of the private sector is confirmed in the OST, private participation of space stations has raised a series of legal issues in the space law regime. These include whether the scope of the liability regime established by the OST and Liability Convention should be widened by directly assigning international liability to private entities, ways to balance the relationship between the public and private sectors in space, and the dilemma of updating the OST regime with an approach that is thorough and all-encompassing or whether it is adequate enough to have a responsive and pragmatic approach that involves modifications of the current space rules in light of the rapid commercial development of space activities. All of these legal issues need to be further examined.

3.1. Outer Space Treaty

The OST has established a basic international legal framework for the exploration and use of outer space,³⁸ as commercial activities of the CSS are also included in the scope of such exploration and use, the relevance of international law to commercial space activities of the CSS should be further examined in the context of the latest space commercial development.³⁹ There is the then problem of whether commercial space activities related with the CSS could be internationally regulated by means of international space law, and then the prerequisite legal issue which should be resolved is what the delimitation between outer space and air space is.

The OST is specifically designed to regulate space activities, and the legal status of outer space has been clearly elaborated in its provisions.⁴⁰ Meanwhile, the complicated issue of the delimitation of outer space, which is

36 Ibid.

37 Ibid, at 111.

38 I. H. Ph. Diederiks-Verschuur and Vladimir Kopal, *An Introduction to Space Law* (3rd edn, Kluwer Law International 2008) 23-24.

39 H.L. van Traa-Engelman, *Commercial Utilization of Outer Space: Law and Practice* (Martinus Nijhoff Publishers 1993) 19.

40 Maurice N Andem, 'The 1967 Outer Space Treaty (1967 OST) as the Magna Carta of Contemporary Space Law: A Brief Reflection' (The 47th Colloquium on the Law of Outer Space, Vancouver, October 2004) 293.

closely related to various factors, has been deliberately ignored by those who drafted the OST for ease of promoting the adoption of this treaty.⁴¹

Even though the importance and necessity of the delimitation of airspace and outer space have been widely acknowledged and discussed by the international community, it has been gradually recognized that, for various reasons, such as scientific and technological development in space, as well as the different requirements of national security and national interests, it is becoming increasingly difficult to reach a consensus on a boundary and definition of outer space by means of an international legal binding instrument.⁴² Under such a dilemma, perhaps it is time for the international society to change mindset of proposing a boundary.

Judging from the practices of the states both in the UN international platform and in national space law and policy making, it is predicted that the issue of delimitation would possibly be resolved in a pragmatic way, namely by combining the influence of non-binding international instruments (the so called “soft law”)⁴³ and national space legislation on the formation of legally binding international regulations. As regards the function of non-binding international norms, it refers to consideration given to proposed documents, such as recommendations, declarations, guidelines and resolutions, both in the course of international and national space legislations regardless whether they are proposed by international organizations or jointly by several countries regionally.⁴⁴

41 In the United Nations, the issue of confirming where outer space starts was raised in the General Assembly Ad Hoc Committee on the Peaceful Uses of Outer Space for the first time. The Ad Hoc Committee, in its Report of 14 July 14 1959, did not consider the issue of delimitation to be ‘susceptible of priority treatment.’ In the later COPUOS, this issue was formally put on its agenda for discussion. For more details, see: UN Doc. A/4141; Bin Cheng, ‘The United Nations and Outer Space’ (1961) 14 *Current Legal Problems* 247, 260-62; Bin Cheng, ‘The Legal Status of Outer Space and Relevant Issues: Delimitation of Outer Space and Definition of Peaceful Use’ (1983) 11 *Journal of Space Law* 89, 93.

42 Michael Listner, ‘Could Commercial Space Help Define and Delimitate the Boundaries of Outer Space?’ (*The Space Review*, 29 October 2012) <<http://www.thespacereview.com/article/2180/1>> accessed 15 May 2016.

43 There is no consensus-based definition for ‘soft law’ currently, in this thesis, “soft law” means any form of international rules that are not a formal legal source of international law (namely international conventions, international custom, general principles, judicial decisions) in the context of Article 38, Para. 1 of the Statute of the International Court of Justice (1945), 33 UNTS 993.

44 Steven Freeland, ‘The Role of ‘Soft Law’ in Public International Law and its Relevance to the International Legal Regulation of Outer Space’ in Irmgard Marboe (ed), *Soft Law in Outer Space: The Function of Non-binding Norms in International Space Law* (Böhlau Verlag 2012) 28-30.

It has been predicted by academics that, in the future, a boundary might be consensually accepted at an altitude between 84 and 100 kilometers,⁴⁵ and in the absence of any official definition of outer space, it could be said that “outer space encompasses the terrestrial and the interplanetary space of the universe, whereby the delimitation of the Earth space around the Earth to outer space starts at least 110 kilometers above sea level”.⁴⁶ These suggestions and official proposal have great significance in resolving the traditional legal issues of space law. The proposed combining of soft law and national space legislation may be adopted to realize legal certainty of these uncertain legal terms and pave the way for dealing with the legal issues arising from the commercialization of the CSS.

3.2. Rescue Agreement

Originating from Articles 5 and 8 of the OST and prompted by humane sentiments,⁴⁷ the Rescue Agreement calls for the rendering of all possible assistance to personnel of a spacecraft in the event of an accident, distress or emergency landing, the prompt and safe return of the personnel, and the recovery and return of space objects.⁴⁸

The increasingly mature technology on reusable launch vehicles is opening the door for the large-scale normalization of space traveling which could attract more people to take part in this commercial space activity. Thus, a trip to the CSS would not only be a privilege for the rich.⁴⁹ In this context,

45 Stephan Hobe, ‘Article I’ in Stephan Hobe and others (eds), *Cologne Commentary on Space Law: Outer Space Treaty*, vol 1 (Carl Heymanns Verlag 2009) 31.

46 Myres S McDougal and Leon Lipson, ‘Perspectives for a Law of Outer Space’ (1958) 52 *American Journal of International Law* 407, 412.

47 Article 5 of the OST provides that, ‘(1) States Parties to the Treaty shall regard astronauts as envoys of mankind in outer space and shall render to them all possible assistance in the event of accident, distress, or emergency landing on the territory of another State Party or on the high seas. When astronauts make such a landing, they shall be safely and promptly returned to the State of registry of their space vehicle; (2) In carrying on activities in outer space and on celestial bodies, the astronauts of one State Party shall render all possible assistance to the astronauts of other States Parties; (3) States Parties to the Treaty shall immediately inform the other States Parties to the Treaty or the Secretary-General of the United Nations of any phenomena they discover in outer space, including the Moon and other celestial bodies, which could constitute a danger to the life or health of astronauts.’ Article 8 of the OST provides that, ‘...Ownership of objects launched into outer space, including objects landed or constructed on a celestial body, and of their component parts, is not affected by their presence in outer space or on a celestial body or by their return to the Earth. Such objects or component parts found beyond the limits of the State Party to the Treaty on whose registry they are carried shall be returned to that State Party, which shall, upon request, furnish identifying data prior to their return.’

48 Preamble of the 1968 Rescue Agreement.

49 At the time of writing, beside the successful rocket recycle experiment conducted by SpaceX in December 2015, the successful reuse of New Shepard booster and the

the dilemmas of the Rescue Agreement surface, on whether this agreement is still a feasible instrument in the era of private human spaceflight, and private space objects and space tourists can be protected within the current space law framework.

From a legal point of view, any definition of an astronaut would appear to require two elements: an element of training and an element of altitude. There must be correlatively, an element of recruitment.⁵⁰ Literally, a typical space tourist is beyond the scope of the terms “astronaut” and “personnel of spacecraft”, as this kind of tourist usually only travels for entertainment instead of employment and does not have affiliation to any organization.⁵¹ In this sense, space tourists are neither astronauts nor envoys of humankind.⁵² In the existing space law regime which aims to protect personnel who are responsible for national space tasks, whether space tourists could be regarded as a protected subject in their private commercial participation, and how they could be protected under space law, have become heated questions of discussion.

Regardless of the type of space tourist, if an individual is taking a trip to the CSS for traveling and without taking any tasks, humanitarian considerations should predominantly be considered in governing assistance to individuals who participate in space activities and their return.⁵³ It could be inferred that the legal regime of providing rescue and return originally designed for astronauts shall also apply to potential space tourists to the CSS when they are found in specified circumstances, which is accorded with the legislative aim of the Rescue Agreement.

Private engagement in space activities has enabled space tourism to become a reality, which means that the legal regime for the return of the personnel of a spacecraft and space objects has even greater relevance to both commercial and private human spaceflights.⁵⁴ Undoubtedly, space stations are currently

smooth return of passenger compartment conducted by a US company named Blue Origin (founded by Jeffrey Bezos, the founder of Amazon.com) also proves that taking a trip to outer space for ordinary people will soon become a reality in the near future. For more information about the recycle process, see: Jeff Bezos, ‘LAUNCH. LAND. REPEAT.’ (*Blueorigin.com* 22 January 2016) <<https://www.blueorigin.com/news>, 2016.1.23.> accessed 23 May 2016.

50 Paul B Larsen and Francis Lyall, *Space Law: A Treatise* (Ashgate Publishing 2013) 131.

51 ‘Definition of Tourist’ (*Merriam-Webster Online Dictionary*) <<http://www.merriam-webster.com/dictionary/tourist>> accessed 22 May 2016.

52 Article 5 of the OST provides that, ‘States Parties to the Treaty shall regard astronauts as envoys of mankind in outer space and shall render to them all possible assistance in the event of accident, distress, or emergency landing on the territory of another State Party or on the high seas.’

53 Paul G Dembling and Daniel M Arons, ‘The Treaty on Rescue and Return of Astronauts and Space Objects’ (1968) 9 *William and Mary Law Review* 630, 642, 646, 661.

54 Henri A Wassenbergh, ‘Law Governing International Private Commercial Activities of Space Transportation’ (1993) 21 *Journal of Space Law* 97, 106.

the most ideal platform for space tourists to experience the wonder of space in person for a period of time.⁵⁵ Thus, the legal status of these tourists and space objects that are utilized for commercial purposes should also be concluded in the existing space law framework. In addition, to facilitate the application of the Rescue Agreement in a commercial environment, such as the CSS, several issues need to be taken into consideration for further improvement, namely relevant legal instruments, time frame, rescue expenses and scope of rescue.

3.3. Liability Convention

According to Article 6 and Article 7 of the OST, when space activities conducted by non-governmental entities violate international laws or cause damages, the corresponding state parties shall bear international responsibility and liability accordingly. In this sense, it is supposed that commercial space activities conducted in the CSS could also be regulated within the framework of the existing space law.⁵⁶

In considering the background during the drafting of the OST and the Liability Convention, it can be observed that the negotiation of the Liability Convention started parallel to that of the Rescue Agreement, as an exchange for the acceptance of the obligations under the Rescue Agreement by the non-spacefaring countries.⁵⁷ This context meant that the final version of the Liability Convention is victim-oriented, specifically, the doctrine of liability fixation on the surface of the earth or for the aircraft in flight takes absolute liability as the leading factor while fault-based liability is taken in outer space, and various ways are provided for the victims to seek remedy from liable launching states.⁵⁸ However, as increasingly more private entities are becoming involved in space activities, and the phenomenon of space commercialization and privatization is not taken into consideration, the Liability Convention is still questioned by various researchers. One of the controversial issues is whether the states shall still be liable for damages

55 The International Space Station (ISS) is currently the only permanently manned outpost for human, a visit to the ISS is described by the Space Adventures as a wonderful experience, the tourist can travel at 17,500 miles per hour, over 250 miles above the Earth's surface and in the condition of weightless, floating inside the station. For more about the information of company that provide such ISS traveling service, see: 'Space Station' (*Space Adventures*) <<http://www.spaceadventures.com/experiences/space-station/>> accessed 18 September 2016.

56 David L Willson, 'An Army View of Neutrality in Space: Legal Options for Space Negation' (2001) 50 *Air Force Law Review* 175, 191.

57 Lesley J Smith and Arnel Kerrest, 'Historical Background and Context' in Stephan Hobe and others (eds), *Cologne Commentary on Space Law*, vol 2 (Carl Heymanns Verlag 2013) 94-95.

58 Jerzy Rajaki, 'Convention on International Liability for Damage caused by Space Objects – An Important Step in the Development of the International Space Law' (The 17th Colloquium of the Law of Outer Space, Amsterdam, September 1974) 245-246.

caused by space objects which are operated by these non-governmental entities.⁵⁹

Dilemma in On-Orbit Transfer

Article 7 of the OST provides that launching states shall be liable for damages caused by their space objects under certain circumstances. However, with the development of commercial space activities, the on-orbit transfer of space objects (such as the possible transfer of modules of the CSS) has posed new issues to this liability regime. When a module of space station is transferred from a launching to a non-launching state in orbit,⁶⁰ the original launching states shall always bear international liability for any damages caused by this module in accordance with the provisions under the OST and Liability Convention.

The above scenario is obviously unequitable. Therefore, to relieve the burden of the liability of the states, this dilemma is usually resolved in commercial practices by using bilateral contracts which stipulate the scope of the liability of each party.⁶¹

Dilemma between Launching States and Private Entities

The question of whether states shall still be liable for damages caused by space objects which are operated by newly emerging entities in the new space era is fiercely debated.⁶² As sovereign states and inter-governmental organizations are the only subjects of space law, the space activities of private entities are regulated by national licensing and supervising procedures.⁶³ Thus the dilemma then becomes the incompatibility between the increasing liability of the state that arises from the privately owned space objects and the inability of private entities to directly undertake international responsibility.⁶⁴ In terms of respecting the status quo of the existing space law regime, but also promoting private space engagement in the CSS, the establishment of a national licensing regime is therefore recommended, which includes the

59 VS Mani, 'Development of Effective Mechanism(s) for Settlement of Disputes Arising in Relation to Space Commercialization' (2001) 5 Singapore Journal of International & Comparative Law 191, 192.

60 Susan Trepczynski, 'Effect of the Liability Convention on National Space Legislation' (2007) 33 Journal of Space Law 221, 241.

61 Bank Cristian and Smith L Jane, 'Capability and Fair Return in European and International Space Cooperation' (The 51st Colloquium of the Law of Outer Space, Glasgow, October 2008) 29.

62 Armel Kerrest, 'Remarks on the Responsibility and Liability for Damages Caused by Private Activity in Outer Space' (The 40th Colloquium of the Law of Outer Space, Torino, October 1997) 137.

63 Frans G von der Dunk, 'The 1972 Liability Convention: Enhancing Adherence and Effective Application' (The 41st Colloquium of the Law of Outer Space, Melbourne, September 1998) 370-371.

64 Ibid.

subject of liability, apportioning of the financial obligation between the government and private entities, and means of compensation.⁶⁵

Moreover, a maximum compensation limit borne by the launching states could be provided in the national legislation or the agreement between the states and private sector, when domestic private entities conclude contracts of commercial space cooperation projects with foreign entities or agencies. This compensation limit could become a reference or even a mandatory licensing condition for their space project.⁶⁶ Currently, with private entities playing an ever so important role in space exploration and exploitation, this proposal appears to be the most ideal means of addressing the dilemma and has been testified as so by several space-faring countries.⁶⁷

Damages Caused by Unidentifiable Space Debris

As of 2015, there are more than 500,000 pieces of debris tracked as they orbit the earth.⁶⁸ However, it is not possible for the international community to track all the unidentifiable space debris that could pose as a significant threat to functional space objects in outer space.⁶⁹ The potential unintentional collisions between functional space objects and space debris is increasing with the increasing volume of space debris, especially massive space objects, such as the ISS, CSS, space shuttles and other spacecraft with humans aboard.⁷⁰ When damage led by such collisions occurs, it is difficult to identify the launching states of these debris, and thus which country shall bear liability is also a serious question. Under this situation, there are two possible approaches. One approach is to impose liability on the relevant spacefaring states and the other is setting up a compulsory liability insurance regime for such accidents.⁷¹

65 Maureen Williams, 'Perceptions on the Definition of a "Launching State" and Space Debris Risks' (The 45th Colloquium of the Law of Outer Space, Houston, October 2002) 280.

66 Zeldine N O'bren, 'Theories of Liability for Space Activities' (2007) 15 Irish Student Law Review 44, 58.

67 For detailed introduction of the national space legislation on licensing conditions for non-governmental entities, see: Ram S Jakhu (ed), *National Regulation of Space Activities* (Springer Netherlands 2010).

68 Mark Garcia, 'Space Debris and Human Spacecraft' (NASA, July 31 2015) <http://www.nasa.gov/mission_pages/station/news/orbital_debris.html> accessed 23 May 2016.

69 Nola T Redd, 'Space Junk: Tracking & Removing Orbital Debris' (*Space.com*, 8 March 2013) <<http://www.space.com/16518-space-junk.html>> accessed 23 May 2016.

70 Mark Garcia, 'Space Debris and Human Spacecraft' (NASA, July 31 2015) <http://www.nasa.gov/mission_pages/station/news/orbital_debris.html> accessed 23 May 2016.

71 G Lafferranderie, 'Space Debris' (The 45th Colloquium of the Law of Outer Space, Houston, October 2002) 45-46.

3.4. Registration Convention

In the existing space law framework, objects launched into outer space by private entities shall be registered by the states which have the obligation to authorize and supervise them.⁷² Under the Registration Convention, there are two levels of registration for the launching state; one is in national registry in which the contents and conditions are determined by the state of registry concerned,⁷³ and the other is the UN register with mandatory information furnished by each state of registry.⁷⁴ The Registration Convention has established a mandatory registration regime. However, in light of the increasing volume of commercial space activities and forthcoming commercialization of the CSS, the shortcomings of the Registration Convention are gradually becoming more evident and need to be resolved.

The first problem is the enforceability of agreements under Article 2 (2) of the Registration Convention which settle the distribution of jurisdiction and control between the launching states. The second problem is that there is no clear timetable to fulfill the obligation of registration under the Registration Convention; only the term “as soon as practicable” that is stipulated in Article 4 provides a standard that is under the subjective discretion of the launching states to decide on when they will register the space object in the UN register.⁷⁵ The third problem is about the contents of registration, at the level of the UN, in considering the continuous development of space technologies, the mandatory information stipulated by the Registration Convention will not be able to fully achieve the utility of the UN Register.

In order to improve the standardization of registration practices and create more informative registration mechanisms, the Registration Practice Resolution (2007) gives state parties more detailed criteria to achieve uniformity in terms of the type of submitted information to the Secretary-General on the registration of space objects, especially on technical standards. A list of recommended additional information which should be furnished is provided in the Registration Practice Resolution.⁷⁶ Furthermore, the

72 See: Article 6 and 8 of the OST.

73 Article 2 of the 1975 Registration Convention provides that, ‘When a space object is launched into Earth orbit or beyond, the launching State shall register the space object by means of an entry in an appropriate registry which it shall maintain.’

74 Article 3 of the 1975 Registration Convention provides that, ‘The Secretary-General of the United Nations shall maintain a Register in which the information furnished in accordance with article IV shall be recorded.’

75 Bernhard Schmidt-Tedd, ‘Article 4’ in Stephan Hobe and others (eds), *Cologne Commentary on Space Law*, vol 2 (Carl Heymanns Verlag 2013) 300-04.

76 UNGA Resolution 62/101, ‘such information to be provided to the Secretary-General on the registration of space objects could include: 2 (a) (i) The Committee on Space Research international designator, where appropriate; (ii) Coordinated Universal Time as the time reference for the date of launch; (iii) Kilometers, minutes and degrees as the standard units for basic orbital parameters; (iv) Any useful information

UNOOSA issued a template called the Registration Information Submission Form to implement their recommendations on upgrading registration practices,⁷⁷ which provides clear directions for the launching state to furnish additional information. In sum, at both the domestic and UN level, the Registration Practice Resolution and Template Registration Information Submission Form that encourage a comprehensive registration regime should be fully respected and implemented. In the long run, a sound registration regime is profound for a better management of the CSS.

4. Conclusion

In this article, the legal basis for the commercialization of the CSS in the international context is examined and it could be concluded that newly emerging commercial space activities and the legal status of private actors in outer space can be permitted and confirmed by international law only if the corresponding state has performed their obligations of authorization and supervision as stipulated in Article 6 of the OST. Two basic space principles and four major space treaties are examined to reach the first conclusion on the newly emerging commercial space activities. Therefore, it is concluded that the relevant provisions of current space treaties and the fundamental space principles are not sufficient enough to regulate the prevailing commercial space activities, including the commercial activities within the CSS. Thus, possible solutions for improving the existing international space law regime should be proposed and examined.

It could also be pointed out that it is not necessary to use an all-encompassing approach to address the revisions of the existing international legal framework when facing with the commercialization trend of large space projects. Instead, a progressive approach that involves modifications to the current space law framework is recommended to take into consideration in the ever changing space environment. Additionally, in light that it is becoming increasingly difficult for the international community to adopt a legally binding space instrument since the 1979 Moon Treaty, a “soft law” approach is suggested as a pragmatic method to resolve this dilemma, and also a critical way to reconcile the public nature of the basic space principles established by the OST with the private nature of commercial space activities.

relating to the function of the space object in addition to the general function requested by the Registration Convention; 2 (b) (i) The geostationary orbit location, where appropriate; (ii) Any change of status in operations (inter alia, when a space object is no longer functional); (iii) The approximate date of decay or re-entry, if States are capable of verifying that information; (iv) The date and physical conditions of moving a space object to a disposal orbit; (v) Web links to official information on space objects.’

77 ‘Registration Information Submission Form’ (UNOOSA) <<http://www.unoosa.org/pdf/misc/reg/regformE.pdf>> accessed 28 May 2016.

Lastly, this article concludes that: with the forthcoming establishment of the CSS around the year of 2022, and the potential participation of different countries and entities in the CSS project, it could be believed that the development of the CSS is also a perfect opportunity for the space law regime to be updated and improved, both at national and international level.