Studies on National Space Legislation for the Purpose of Drafting China's Space Law

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Contents

Preface

This research has been conducted in the context of my doctoral thesis. In the context of strengthening the rule of law in China, especially space activities' development as a national development strategy, this research on China's national space legislation is significant. During this research, I received an abundance of help for which I want to express my gratitude.

First, I would like to express my deepest gratitude to my doctoral supervisor Prof. Dr. Lesley Jane Smith. Without her patient advice and constructive guidance throughout the research process, this thesis would not have been accomplished. I also want to express my thanks to her for her great kindness and concern about my life in Germany.

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Huan Yu
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Introduction

Space technology is used overwhelmingly in people's daily life. It is not exaggerated to say that the space technology development and utilization has subverted what people could imagine.

The epoch of exploring and utilizing outer space officially opened in the year 1957 when the Soviet Union conducted the launch of the world's first artificial satellite. Against the Cold War background, the United Nations soon took action on this issue of peace and security confronting humanity by adopting important resolutions. An *ad hoc* Committee[1] was established to oversee the peaceful uses of outer space and one year later, the United Nations Committee on the Peaceful Use of Outer Space (UNCOPUOS)[2] was set up as a standing body to govern the peaceful uses of outer space. Important legal principles governing the activities of States in the exploration and use of outer space were laid down by the UN in 1963 by way of another resolution.[3] This resolution set the basic tone for international space legislation and forms the basis of the first space treaty, the 1967 Outer Space Treaty.[4]

From 1967 to 1979, the United Nations bore abundant fruit in the creation of international space treaties. Five treaties namely, the Outer Space Treaty, the Rescue Agreement,[5] the Liability Convention,[6] the Registration

[1] UNGA Res. 1348 (XIII), Question of the Peaceful Use of Outer Space, 13 December 1958.

[2] The Committee on the Peaceful Uses of Outer Space (COPUOS) was set up by the General Assembly in 1959 to govern the exploration and use of space for the benefit of all humanity: for peace, security and development COPUOS was created in 1959 as the main UN body to govern the exploration and use of space and was instrumental in the creation of the five major space treaties. It has been the main multilateral forum where countries meet to discuss space issues and share updates on national activities and practices. http://www.unoosa.org/oosa/en/ourwork/copuos/index.html

[3] UNGA Res. 1962 (XVIII), Declaration of Legal Principles Governing the Activities of States in the Exploration and Uses of Outer Space, 13 December 1963.

[4] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967).

[5] Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, Adoption by the General Assembly: 19 December 1967 (resolution 2345 (XXII)), Opened for signature: 22 April 1968 in London, Moscow and Washington, D.C. Entry into force: 3 December 1968.

[6] Convention on International Liability for Damage Caused by Space Objects, Adoption by the General Assembly: 29 November 1971 (resolution 2777 (XXVI)), Opened for signature: 29 March 1972 in London, Moscow and Washington, D.C. Entry into force: 1 September 1972.

Convention[7] and the Moon Agreement[8] were concluded and form the substantive international law framework for outer space activities.

With space technology's advancement since the 1980s, more and more countries and private sectors have become involved in this arena. The legal regime constituted by the international treaties shows its inadequacy in the trend of space commercialization and privatization. However, States turned away from concluding treaty law in the following years, instead, we have witnessed the further development of international law by way of so-called soft law, namely through resolutions of principles and recommendations elaborated through UNCOPUOS and adopted by the UN General Assembly. In the meantime, national space legislation, in its nature being easier to enact and having more flexibility in contrast to international agreements, distinguishes itself as a feasible tool to fill the gaps.[9] Especially the growing involvement of non-governmental entities in different space projects has strengthened the role of national space law as an instrument to ensure that all space activities are carried out in conformity with the obligations arising from international space law, most importantly the UN space treaties.[10] At present, more than 20 countries have already formulated national space regulations,[11] and many more are prepared to do so.

A. Research Problem and Purpose

Space-related science and technologies affect our daily life dramatically. Many countries have already formulated national space regulations to

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[7] Convention on Registration of Objects Launched into Outer Space, Adoption by the General Assembly: 12 November 1974 (resolution 3235 (XXIX)), Opened for signature: 14 January 1975 in New York, Entry into force: 15 September 1976.

[8] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Adoption by the General Assembly: 5 December 1979 (resolution 34/68), Opened for signature: 18 December 1979 in New York, Entry into force: 11 July 1984, Depositary: Secretary-General of the United Nations.

[9] Wu, Xiaodan, *China's space law: Rushing to the finish line of its marathon,* Space Policy (46) 2018, p. 39.

[10] Marboe, Irmgard/Aoki, Setsuko, *Historical Background and Context NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne 2015, p. 492.

[11] A specific analysis can be found in Setsuko Aoki, *Practical Background of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne 2015, pp. 503-546. See also Chapter II of the present research.

regulate their space activities. China, as one space-faring country, has obtained impressive achievements in space science and technologies. In recent years, Chinese private space companies have sprung up quickly, which requires a stable and foreseeable legal framework to ensure development. However, compared to the other space powers, China is the only one that has not enacted any formal national space laws. Against the background of strengthening the rule of law in China,[12] research on China's domestic space legislation is valuable and significant.

The purpose of this thesis is two-fold. First, to find the legal basis and necessity of national space legislation and to extract the basic content of the existing national space legislation, simultaneously, to identify the new developments in the content of other States' legislative practices. Second, based on the study of national space legislation, to propose the essential content of China's space legislation.

B. Research Methodology

I. Doctrinal Methodology

This research is conducted primarily with a 'doctrinal' or 'black letter law' methodology. This means that most of the research is based on analyzing the legal rules under the wording of the international space treaties, other international agreements and respective national space legislation. This approach enables the researcher to critically analyze the meaning and implications of these rules.

This approach is acceptable as national space legislation is largely a black letter law subject, which is derived from the provisions of international space treaties. However, it is important to note that the study of law, in this case, national space law, is based on logical conclusions formed by the influence of other factors, such as respective space developments, national politics,

[12] Since the outset of his mandate, President Xi Jinping has explicitly stated that rule of law and judicial reform are key points on his agenda. In October 2014, the 4th Plenary Session of the 18th Central Committee of the Communist Party of China adopted *The Decision of the Central Committee of the Communist Party of China on Major Issues Concerning Comprehensively Advancing the Rule of Law*. The Decision depicted a blueprint for building the rule of law in China and proposed new requirements for comprehensively advancing the rule by law, see http://www.china.org.cn/china/ fourth_ plenary_ session/ 2014-12/02/content_34208801.htm.

strategies and economics. The thesis does not aim to establish any claims to socio-legal research; rather its primary aim is to provide a thorough, in-depth examination of the legislative practices of States. When examining the rationale behind adopting certain kind of regulations, it might be necessary to focus on the specific space development, which may have led to the legislative decision. For example, an examination of the legal implications on the national space resource regulations, which were adopted by the USA will inevitably lead the researcher to look beyond the black letter law.[13] Those analyses of legislative backgrounds support the achievement of the research purpose.

The doctrinal approach involves identifying certain legal rules. For example, in Chapter I, relevant provisions related to national space legislation of the international treaties will be analyzed specifically. In Chapter II, a conclusion on the content of national space legislation will be drawn having regard to the Model National Space Law made by the International Law Association (ILA Model Law)[14] and the Resolution on Recommendations on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space (Natleg Resolution).[15] Detailed provisions in national space regulations will also be dissected. In Chapter III, the developments in national space regulations will be identified and expounded. Furthermore, in Chapter IV, two Chinese administrative measures will be commented upon. Once the individual legal rules have been identified, the identification of a legal basis and the content of national space legislation shall emerge. This will enable the thesis to eventually propose the content of Chinese national legislation.

The main sources of data for doctrinal research are the legal instrument itself, in this case, the international space documents and the legal documents of respective States. Research into those documents is very accessible, most if not all of them are available online.

However, this is not sufficient to identify the necessary content for

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[13] See discussion in Chapter III-A-I.

[14] More information on the ILA Model Law including its full text can be found in: Hobe, Stephan, *The ILA Law for National Space Legislation,* German Journal of Air and Space Law (1) 2013, pp. 81-95.

[15] UNGA 68/74, Recommendations on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space, 11 December 2013.

national space legislation. Therefore, it is inevitable to make references to existing commentaries, which offer an insight into the meanings of respective legal provisions. This helps the research demonstrate a wider understanding of the relevant issues. Most of these materials are readily available on legal databases online, as well as in the form of books, journal articles, conference papers and other industry and professional publications.

II. Comparative Method

This thesis also incorporates a comparative approach as a method of research rather than as a methodology. Such an approach has been used so that the thesis does not focus on comparing legal systems; rather, it uses the comparative method in measuring whether certain kinds of domestic space provisions are suitable for Chinese space legislation. When incorporating a comparative approach in a thesis, it is important to identify why the researcher has chosen this approach and how it can be justified as a legitimate method. In the context of national space legislation, specific needs and practical considerations lead the States to enact a national legal framework, which often closely corresponds to the type of space activities conducted.[16] The aim of using the comparative method should be to improve and understand one's own domestic legal system by analyzing how other States have dealt with the same problem. One of the aims of this thesis is to assess whether it could also be necessary for China to consider the new developments in national space legislation. Thus, this thesis analyzes the legislative basis for such new development. In addition, the comparative approach is also used when this thesis demonstrates that the international legal regime is needed regarding the debated national regulations.

The comparative method adds a critical tool for analysis of the contents of national regulations. Furthermore, it assists in distinguishing particular features in respective domestic regulations. When conducting the comparative method, the source materials are gathered not only from the legal rules but mainly from the policy papers and space industry development news,

[16] Marboe, Irmgard, *National Space Law,* in: Von der Dunk, Frans/Tronchetti, Fabio (eds.), Handbook of Space Law, Edward Elgar Publishing Limited, Cheltenham, 2015, pp.183-184.

which have been published.

C. Research Structure

The main themes of this thesis are the legal basis, basic content and new developments of national space legislation. The thesis seeks to propose the content, which should be included in Chinese space legislation. Five chapters have been constructed to achieve the research purpose, and the elementary framework is shown as follows:

Chapter I examines the legal basis of national space legislation, which was created by the international obligations. The crucial provisions in the five space treaties, which are essential to trigger the establishment of national space law, will be analyzed. Moreover, the rules from other international documents which may potentially impact domestic law-making will be considered. Chapter I also observes that the rapid growth of space commercialization and privatization is the other factor, besides international obligations, motivating States to make space regulations. In order to support such growth, States are ready to take legislative measures.

To extract the basic content of national space legislation, Chapter II examines existing national space legislation practices. Although the existing practices are diverse, this thesis aims to identify the basic content for China's space legislation. In the research process, the ILA Model Law and the Natleg Resolution provide the thesis with the opportunity to gather the basic content. The former is an authoritative academic research result made by way of a detailed comparison of all of the primary domestic space laws, and the latter is a resolution adopted by the United Nations General Assembly. Both are qualified to be taken as references when formulating national space law. Chapter II summarizes further the basic content of national space legislation based on the wording of these two documents.

In the last five years, domestic legal instruments have started to concern many other provisions, besides the basic ones relating to authorization and registration etc. States wish to shape domestic space regulations to conform to their own legal systems, meanwhile servicing the development of their

private sectors. To meet the ends of the research purpose, this thesis also observes the new content, additional to the basic content in Chapter III. After having summarized these new national legislative practices for space, this thesis finds that three aspects of content are of sufficient importance to warrant them being examined. One aspect is on the national space resources regulations, which are challenging the international space treaties resulting in an epicenter of academic discussion. This thesis launches an analysis surrounding Space Resource Exploration and Utilization, Title IV of the U.S. Commercial Space Launch Competitiveness Act.[17] Subsequently, Chapter III will observe domestic regulations on sub-orbital flight and private spaceport operation. These two aspects do not cause huge controversy; however, the thesis regards these aspects as the focal points of future national space legislation. The 2018 UK Space Industry Act[18] will be taken as a reference for these two aspects. The new content touches upon the commercial areas of outer space that are not comprehensively stipulated by any effective international treaties or other international instruments. When it refers to the matters that international law does not clearly regulate, domestic laws receive the opportunity to fill in the gaps. From the perspective of making national space law, it is desirable that the new content be taken into consideration once all of the relevant situations influencing space law creation pertaining to the country are thoroughly concerned.

For the purpose of solving the research question, this thesis holds that it is essential to analyze the related situation in China. International treaties and other documents motivate China, as a member thereof, to create space law. Legislative practices of the other States depict important references. However, the relevant situation in China itself shapes the content of China's space law inherently. This thesis regards space policies, space activities and the status quo of China's space law as the fundamental factors directly related to China's space lawmaking. This thesis undertakes a thorough examination of those aspects in Chapter IV.

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[17] U.S. Commercial Space Launch Competitiveness Act, Pub. L. No. 114-90, 129 Stat. 704 (2015).

[18] For more information, please see: https://www.parliament.uk/business/bills-and-legislation/, also see Chapter III-B-I of the present research.

Based on the findings on the legal basis, basic content and the new developments of national space legislation, in conjunction with the situation in China, this thesis will then ultimately be able to propose the content of China's space legislation. Chapter V also presents an overview of the Chinese legal system to clarify the relationship between law and administrative regulations for national space legislation before illustrating the detailed contents.

Chapter I. The Legal Basis and Necessity of National Space Legislation

It is widely recognized that the need for national space legislation is rooted in the five UN space treaties and the space-related UNGA resolutions elaborated upon by UNCOPUOS, which contain several concrete obligations and recommendations for States.[19] After the adoption of the Outer Space Treaty in 1967, four main treaties, namely the 1968 Rescue Agreement (ARRA), the 1972 Liability Convention (LIAB), the 1975 Registration Convention (REG), as well as the 1979 Moon Agreement (MOON), were created. These five international treaties construct the basic legal framework for the exploration and utilization of outer space, their relevant regulations are essential resources for national space legislation. Alongside these regulations from the international space treaties, two principles derived from the regulations of the International Telecommunication Union (ITU)[20] should also be included within the scope of national space legislation.

The necessity of States enacting national space legislation lies in the features of privatization and commercialization of space activities. The uttermost of taking enormous benefits from space activities is attributed to their private and commercial nature. To fulfil the obligations set by the international treaties is no longer be the single target for States. National space legislation should make a balance in the relationship between authorization and supervision by States and the encouragement and promotion of private participation to achieve well-allocated interests for each party.

In the present Chapter, the provisions which can be recognized as the legal resources of national space legislation from international agreements and the privatization and commercialization of outer space will be introduced and analyzed. Before digging into the detailed provisions of the international space treaties, a short introduction of the relationship between international

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[19] Marboe, Irmgard, *Introduction and Context of the 2013 NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne 2015, p. 495.

[20] Namely the ITU Constitution and the Radio Regulations of the ITU.

space law and national space legislation will be provided.

A. International Space Law and National Space Legislation

Space law, in its broad and functional sense, refers to all rules and regulations formulated to deal with legal problems arising from the exploration and use of outer space.[21] Sources of space law can be divided into two layers. The international layer includes treaties, bilateral and multilateral agreements, customary international law, regulations set by international organizations; the national layer includes various legal instruments regulating domestic space activities.

I. International Space Treaties and National Space Law

The era of the treaty law-making period commenced with the establishment of the 1967 Outer Space Treaty and ended with the conclusion of the 1979 Moon Agreement. Five international space treaties with a binding character constitute the nucleus of space law, laying down the basic legal principles for outer space activities. The obligations derived from the treaties urge state parties to enact national space regulations. Those provisions in the treaties relating to private space activities form the basic contour of national space regulations, although at the time when the treaties were concluded private space activities were only theoretical scenarios.

II. International Space Soft Law and National Space Law

When the fear of space war gradually ceased, having been tackled by the peaceful exploration and use principle originating from the outer space treaties, and given the rising number of participants in space activities with diversified concerns, states are reluctant to conclude binding international treaties. However, this did not lead to the stagnation of international space law. From the beginning of the 1980s, the development of international space law furthered by means of so-called soft law,[22] namely through principles,

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[21] Malanczuk, Peter, *Actors: States, International Organisations, Private Entities,* in: Gabriel Lafferanderie (ed.), Outlook on Space Law Over the Next 30 Years, Kluwer Law International, the Hague, 1997 p. 29.

[22] Soft Law is law that is not created in the traditional manner i.e. through the creation of treaties. Soft law can be defined as written instruments that might purport to specify standards of conduct but which

declarations and recommendations elaborated by UNCOPUOS and adopted by the UN General Assembly.

Among these resolutions, there are three important principles governing the particular types of space activities, including the use of artificial earth satellites for international direct television broadcasting,[23] the remote sensing of the earth from outer space,[24] and the use of nuclear power sources in outer space.[25] These principles were developed by the influence of the use of certain space technologies. Following these principles pertaining to specific space activities, in 1996 the UNGA adopted a declaration focusing on international cooperation,[26] providing international cooperation should be structured in the exploration and use of outer space not only between developed and developing countries, but also among developing countries themselves.[27]

After the millennium, the UNGA adopted a further three resolutions dealing with the application of the concept of the "launching state",[28] the registration of space objects,[29] and national space legislation.[30] Although it is stated in the preambular paragraphs of these respective resolutions that they do not provide an authoritative treaty interpretation or amend the treaties, these resolutions indeed resolve to provide a certain clarification of the treaty provisions aiming to foster coordination in the application of state

do not emanate from the traditional 'sources' of public international law. Freeland, Steven, *The Role of 'Soft Law' in Public International Law and its Relevance to the International Legal Regulation of Outer Space*, in: Marboe Irmgard (ed.) Soft Law in Outer Space: The Function of Non-binding Norms in International Space Law, Boehlau, Vienna, Cologne, Graz, 2012, p. 19.

[23] UNGA Res. 37/92, Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting, 10 December 1982.

[24] UNGA Res. 41/65, Principles Relating to Remote Sensing of the Earth from Outer Space, 3 December 1986.

[25] UNGA Res. 47/68, Principles Relevant to the Use of Nuclear Power Sources in Outer Space, 14 December 1992.

[26] UNGA Res. 51/122, 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, 13 December 1996.

[27] Hobe, Stephan/ Tronchetti, Fabio, Historical Background and Context of SB Declaration, in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne 2015, p. 316.

[28] UNGA Res. 59/115, Application of the Concept of the "Launching State", 10 December 2004.

[29] UNGA Res. 62/101, The 2007 Recommendations on Enhancing the Practice of States and International Intergovernmental Organization in Registering Space Objects, 17 December 2007.

[30] UNGA Res. 68/74, Recommendations on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space, 11 December 2013.

responsibility and liability in the area of private space activities in particular,[31] and harmonized practice of registration and national space legislation.[32]

Apart from the above-mentioned resolutions, two guidelines are of sufficient significance to be mentioned, i.e., the UNCOPUOS SDM Guidelines[33] and the UNCOPUOS LTS Guidelines.[34] These two guidelines are closely related to the preservation of the outer space environment. The UNCOPUOS SDM Guidelines focusing on the mitigation of space debris endorsed by the UN General Assembly in 2007 are of legal significance and are likely to become more relevant in the future due to the increasing safety risks caused by the ongoing proliferation of debris.[35] The UNCOPUOS LTS Guidelines, which aim to propose measures to ensure the safe and sustainable use of outer space for peaceful purposes and for the benefit of all countries, are the working result of the Working Group on the Long-Term Sustainability (LTS) of Outer Space Activities established by UNCOPUOS in 2010. A set of the UNCOPUOS LTS Guidelines was agreed by the Committee in 2016. Consensus was reached on a preamble and nine additional guidelines in 2018. The long-term sustainability of outer space activities continues to be an agenda item of the Scientific and Technical Subcommittee.[36]

These principles, declarations, recommendations, as well as guidelines, have become widely accepted by the international space community,[37]

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[31] Aranzamendi, Sanchez M./Riemann, Frank/Schrogl, Kai-Uwe, *Future Perspectives of LSR,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne 2015, p. 399.

[32] Schmidt-Tedd, Bernhard/Hedman, Niklas/Hurtz, Anne, *Future Perspectives of RPR,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne 2015, p. 463.

[33] UNGA Res. 62/217, In its resolution 62/217 of 22 December 2007, the General Assembly endorsed the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space and agreed that the voluntary guidelines for the mitigation of space debris reflected the existing practices as developed by a number of national and international organizations, and invited Member States to implement those guidelines through relevant national mechanisms: The 2007 Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space.

[34] In June 2016, the Committee agreed to a first set of guidelines for the long-term sustainability of outer space activities (A/71/20, Annex). In 2018, consensus was reached on a preamble and nine additional guidelines (A/AC.105/1167, Annex III and A/73/20), http://www.unoosa.org/oosa/en/ourwork/topics/long-term-sustainability-of-outer-space-activities.html

[35] Stubbe, Peter/Kopal, Vladimir/Schrogl, Kai-Uwe, *Future Perspectives of SDM Guideline,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne 2015, p. 643.

[36] http://www.unoosa.org/oosa/en/ourwork/topics/long-term-sustainability-of-outer-space-activities.html

[37] http://www.unoosa.org/oosa/en/ourwork/spacelaw/resolutions.html

offering valuable guidance and creating technical norms without having to go through the long arduous process of making treaties,[38] avoiding the situation of a legal lacuna in specific areas. Although these international agreements do not impose obligations on the states like space treaties would, they express a strong political will to adhere to the rules contained therein;[39] thus they are valuable legal sources for national space legislation.

In sum, the international space treaties provide the legal basis for national space legislation due to their binding force, while the international space soft law provides specific guidance, which required full consideration. The following parts focus on the treaty provisions for national space legislation and also lists the detailed rules extracted from soft law with regard to private space activities.

B. The Outer Space Treaty (OST) and National Space Legislation

The OST laid down the foundations of the international regulation of space activities and established the framework of the legal regime of outer space and celestial bodies. Among those articles in the OST, Art. II, Art.VI, Art. VII, Art. VIII and Art. IX are of significance in creating national space law. Art.VI provides motivation for States to create national space legislation. Art. II, Art. VII, Art. VIII and Art. IX codify the obligations set up by the OST, which should be implemented in national space legislation.

I. Art. VI: International Responsibility - the Motivation of States to Create National Space Legislation

Art. VI of the OST stipulates that:

"States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are

[38] Urban, Jennifer Ann, *Soft Law: The Key to Security in a Globalized Outer Space*, Transportation Law Journal 43(1) 2016, p. 48.

[39] This is especially the case for the resolutions drafted by the UNCOPUOS as their wording and submission to the General Assembly is subject to consensus. Stubbe, Peter, *The UN General Assembly Resolutions Pertaining to Outer Space,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne 2015, p. XXXIX.

carried out in conformity with the provisions set forth in the present Treaty. The activities of non-governmental entities in outer space, including the moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty".[40]

This article deals with international responsibility for activities in outer space. This responsibility shall be borne by States for both-governmental and non-governmental activities. Non-governmental entities are not directly bound by the OST, which is ratified by the State, as such entities are not exercising supreme State authority. A much more crucial issue than the identification of the State internationally responsible for activities conducted by governmental agencies is the identification of the State internationally responsible for non-governmental entities.[41] Non-governmental entities are natural and legal persons of private law, as well as universities and research organizations (even where they are run as public statutory corporations),[42] the space activities of which can be seen as private activities. International responsibility for private space activities thus acts as a strong incentive for States to enact national space legislation.[43]

When discussing a definition of the term "responsibility", the understanding of another term, i.e., "liability," will always be mentioned. The specifics of the distinction between these two terms will be discussed in the following paragraphs. Generally speaking, the terminology "responsibility" in Art VI of the OST can be simply interpreted as the obligation of management and control.[44] In brief, Art. VI is considered to be the only article, which explicitly deals with non-governmental activities in outer

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[40] Art. VI of the Outer Space Treaty.

[41] Gerhard, Michael, *Art. VI of the Outer Space Treaty*, in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume I, Carl Heymanns, Cologne 2009, p. 111.

[42] Ibid., at p. 110.

[43] Marboe, Irmgard, *Introduction and Context of the 2013 NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne 2015, p. 496.

[44] When translating the terms of responsibility and liability into Chinese, there is no difference between them in the text of the treaty but in academic research, some researchers understand the specific meaning of responsibility as the liability for control and management. See: the Chinese translation of COCOSL I by Li Shouping, Zhang Zhenjun, Wang Guoyu and Wu Xiaodan.

space.[45] Against the background of the rapid development of space commercialization and privatization, in discussing the creation of national space law, this article in the OST should be of particular concern.

Art. VI sentence 2 imposes an international obligation on States to authorize and continuously supervise activities of non-governmental entities. This is the starting point for the discussion on the necessity of national space legislation, although national space legislation is more than just the implementation of an authorization and supervision procedure.[46] There are many arguments about the specifics of the State authorizing and continuously supervising the activities of its nationals but the starting point should be that the State that has jurisdiction over an activity is the only one that can bear international responsibility.[47] Accordingly, the provisions of determining the jurisdiction of a State over relevant activities of its nationals should be included in national space law.

The national space legislation provisions, which mainly deal with the issues of implementing the authorization requirements are categorized under the strict sense (or narrow sense) of national space legislation.[48] Generally speaking, national space legislation in a narrow sense always includes the conditions of authorizing the relevant space activities of a state's nationals, and the OST has only indicated two categories of authorization conditions, i.e., firstly, to assure that the activity is carried out in conformity with the provisions set forth in the OST; secondly, to ensure the safety of the activity.[49] In addition to these two conditions proposed by the OST, States are free to establish other authorization conditions. In practice, many countries have

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[45] Gerhard, Michael, *Art. VI of the Outer Space Treaty*, in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume I, Carl Heymanns, Cologne 2009, p. 117.

[46] Ibid.

[47] Von der Dunk, Frans, *Private Enterprise and Public Interest in the European 'Spacescape'*, Leiden University, 1998, p. 19.

[48] Von der Dunk, Frans, *National Space Legislation,* in: ECSL ed., the 11th European Summer Course on Space Law and Policy, 2002, p. 43.

[49] See Art. VI, Sentence 2, and Art. VII of the OST, see also the description of Gerhard, Michael, *Art. VI of the Outer Space Treaty*, in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume I, Carl Heymanns, Cologne 2009, p. 117, and Lachs, Manfred, *The Law of Outer Space: An Experience in Contemporary Law-Making,* Martinus Nijhoff Publishers, Leiden, p. 115.

established related conditions with regard to the authorization of private space activities. Since the discussion of such authorization conditions is an essential part of this monograph, more details will be analyzed in the following parts.

As described above, States are required to supervise the space activities of their non-governmental entities continuously. It is believed that the requirement of continuing supervision is not a requirement concerning substantive law, but rather a requirement concerning procedure.[50] The OST does not specify how continuing supervision should be implemented,[51] States are free to determine the specifications.

In short, Art. VI OST provides motivation for States to create space law. More specifically, firstly, this article confirms that the appropriate State is internationally responsible for the space activities of its nationals; and secondly, this article proposes that the appropriate State is obliged to develop the space activities of its nationals, namely, to authorize and continuously supervise the activities of its non-governmental entities in outer space. Following the adoption of the 1967 OST, the space industry rapidly developed, and the legal issues regarding outer space activities became increasing complicated,[52] so national space regulations adopted in regard to the latter include more comprehensive content. The present monograph focuses on the creation of Chinese space law. The new development of the space industry, as well as the space laws, are necessary to consult, but the provisions (especially Art. VI) of the OST are still the major basis of Chinese space law.

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[50] Gerhard, Michael, *Art. VI of the Outer Space Treaty*, in: Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume I, Carl Heymanns, Cologne 2009, p. 119.

[51] Ibid.

[52] The general situation of the legal issues regarding outer space activities can be summarized based on the treaties and other legal documents, which were enacted and created after the OST. More specifically, after the year 1967, four main treaties were adopted (with respect to the analysis of the four outer space treaties, see: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), *Cologne Commentary on Space Law, Volume I,* Carl Heymanns, Cologne 2009. Also see Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), *Cologne Commentary on Space Law, Volume II,* Carl Heymanns, Cologne, 2013), in addition several representative Resolutions were created by the United Nations General Assembly, which include: The 1982 Principle Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting; The 1986 Principles Relating to Remote Sensing of the Earth from Outer Space; The 1992 Principles Relevant to the Use of Nuclear Power Sources in Outer Space; and The 1996 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. (for more details, see: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), *Cologne Commentary on Space Law, Volume III,* Carl Heymanns, Cologne, 2015.).

II. The Obligations Set up in the OST Which Should be Implemented in National Space Legislation

The provisions of the OST are mainly applied to the space activities of the State parties which have ratified this treaty but as mentioned above, the State parties are obliged to ensure that the activities of their nationals are in conformity with the regulations of the OST.[53] In other words, the OST is also applicable to the relevant private participants of space activities. By way of concluding with regard to the text of the OST, the following obligations will be selected by the present author as necessary to consult when drafting national space legislation.

1. Art. II: Non-Appropriation of Outer Space Including the Moon and Other Celestial Bodies

It is commonly accepted that outer space including the Moon and other celestial bodies cannot be appropriated by any State using any means in the process of exploration and exploitation.[54] This is the basic legal principle of space activities, and it is worth noting that by the time the OST was concluded, the idea of the "non-appropriation" of outer space (including the Moon and other celestial bodies) was already widely accepted in practice.[55] However, it is necessary to note that Art. II of the OST only mentions an exclusion for the "national appropriation" of outer space including the Moon and other celestial bodies,[56] the case of non-governmental entities is not mentioned. However as proposed by researchers, after considering the specific definition of the term "national," which is applied in Art. II, as well as Art. VI of the OST, it can be concluded that the "national" activities the article (Art. VI) refers to include those of "non-governmental" entities.[57] Moreover, the terms

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[53] Art. VI of the Outer Space Treaty.

[54] Art. II of the Outer Space Treaty.

[55] Freeland, Steven/Jakhu, Ram, *Art. II of the Outer Space Treaty,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume I, Carl Heymanns, Cologne 2009, p. 45.

[56] Art. II of the Outer Space Treaty.

[57] Freeland, Steven/Jakhu, Ram, *Art. II of the Outer Space Treaty,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume I, Carl Heymanns, Cologne 2009, p. 52.

contained within Art. XI of the MOON also appear to support the conclusion that the non-appropriation principle applies in relation to the actions of non-State entities and natural resources.[58]

In brief, the principle of non-appropriation regulated in Art. II of the OST has generally been accepted as a rule of customary international law. However, in the context of national space legislation, this principle has been challenged. A precise example is the adoption of the Space Act of 2015 by the United States, which allows citizens of the US to engage in the commercial exploration and exploitation of space resources.[59] This will be discussed in much more detail as one of the new developments of national space legislation in Chapter III of the present study. As a space-faring country, China should obey the obligations of the OST in the process of creating national space legislation, on the other hand it is also necessary for China to consider such examples of newly arising situations more thoroughly and in doing so deal with new changes more carefully.

2. Art. VII: International Liability of the Launching State

Art. VII of the OST addresses the following:

"Each State Party to the Treaty that launches or procures the launching of an object into outer space, including the Moon and other celestial bodies, and each State Party from whose territory or facility an object is launched, is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air space or in outer space, including the Moon and other celestial bodies."[60]

The general principle of liability imposed by Art. VII on a launching State has been further elaborated upon in the LIAB.[61] Furthermore, more specifics regarding the term "launching State," as well as the term "liability," will be

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[58] Ibid.

[59] Orphanides, K. G, *American Companies Could Soon Mine Asteroids for Profit,* online at: http://www.wired.co.uk/news/archive/2015-11/12/how-to-mine-asteroids-for-fun-and-profit

[60] Art. VII of the Outer Space Treaty.

[61] Kerrest, Armel/Smith, Lesley Jane, *Art. VII of the Outer Space Treaty,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume I, Carl Heymanns, Cologne 2009, p. 129.

further analyzed in the following paragraphs pertaining to the LIAB. In the present paragraph, it is necessary to illustrate the relevance of Art. VII of the OST to the creation of national space law. In short, Art. VII of the OST imposes the duty to provide compensation for damage resulting from all launching operations on State Parties, regardless of whether the launching operation is initiated by governmental or non-governmental entities.[62] From this point of view, after the relevant State Party has paid compensation for damage caused by the space activities of its nationals, it is common for the State to reserve the right to obtain indemnification from the relevant private entities. Thus, it is necessary to create legal mechanisms under the framework of national space law in this regard.

3. Art. VIII: Registration of Space Objects

Art. VIII of the OST specifies that a State Party to the treaty on whose registry an object launched into outer space is included shall retain jurisdiction and control over such an object, and over any personnel thereof, while in outer space or on a celestial body. This article is mainly relevant to the issue of jurisdiction but also embodies the content of national registries.[63] Two focal points of this provision are vital to consider in national space law. First, this article requires States to establish a national registry, though it does not provide a detailed procedure and requirements for the registration of space objects. Second, the national registry also records the space objects of private entities as all space activities emanating from the private sector are considered to be activities of their States under the OST.

To continuously supervise private entities' space activities as required by Art. VI of the OST, establishing a national registry of space objects launched by non-governmental entities is an effective measure to have knowledge of and oversight over all of the space activities conducted by them. Furthermore, considering the increasing number of private entity's satellite launches, the registration of private launches requires more detailed guidance in the form

[62] Ibid., p. 128.

[63] Diederiks-Verschoor, I.H.Ph, *An Introduction to Space Law,* Kluwer Law International, The Hague, 1999, p. 30.

of domestic legislation. Moreover, in the context of some states' national space legislation, the registration of space objects by private parties could also be among the preconditions of authorizing private space activities.[64] Further debate on registration will be illustrated in the following parts.

4. Art. IX: The Protection of the Environment of Outer Space and the Earth

Protecting the environment of outer space, as well as the earth, in the process of carrying out space activities was recognized early on as an obligation to be upheld in the process of space activities no matter whether they were carried out by the government or by non-governmental entities. As regulated in Art. IX of the OST, State Parties to the Treaty shall [...] conduct the exploration of outer space, including the moon and other celestial bodies so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter and, where necessary, they shall adopt appropriate measures for this purpose.[65] As when the OST was adopted, the space industry was not comprehensively developed, this provision does not specify the scope of the harmful contamination of outer space. Moreover, the "appropriate measures" to be taken are also not clearly defined.

An important field concerning the protection of the environment in outer space is the mitigation of space debris.[66] After the adoption of the "Space Debris Mitigation Guideline" by the Inter-Agency Debris Coordination Committee (IADC)[67] in 2002, many States (also territories) started to take legal measures to minimize space debris in space activities.[68] Some States

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[64] CFR 14/III/415.81. And Section 5(2)(b) Outer Space Act, United Kingdom. See also, Schmidt-Tedd, Bernhard/Mick, Stephan, *Art. VIII of the Outer Space Treaty,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume I, Carl Heymanns, Cologne 2009, p. 166, fn 113, 114.

[65] Art. IX of the Outer Space Treaty.

[66] For more details on the mitigation of space debris, see: Tronchetti, Fabio, *The Problem of Space Debris: What can Lawyers do About It?* German Journal of Air and Space Law (2) 2015, pp. 332-352.

[67] For more information about the IADC, see: http://www.iadc-online.org/index.cgi?item=home, with respect to the text of the IADC Space Debris Mitigation Guidelines, see: http://www.iadc-online.org/index.cgi?item=docs_pub

[68] Regarding the national practices on space debris mitigation, a general introduction can be found in: Kato, A, *Comparison of National Space Debris Mitigation Standards,* Advances in Space Research, (9)

have also included legal measures for mitigating space debris in their national space legislation. As a space-faring country in the world, China's National Space Administration (CNSA) is also a participant of the IADC, in other words, in future Chinese space law, there should be provisions regarding the mitigation of space debris.

To sum up, the 1967 OST not only creates the fundamental legal principles for the participants of space activities but also provides the legal basis for the establishment of national space legislation, which mainly deals with the relevant activities of non-governmental entities. In the paragraphs above, the general rules included in the OST, which can be applied in national space legislation, have been introduced and analyzed. However, it is notable that all of the basic legal principles set up by the OST must be adhered to by all of the participants of space activities, in other words, these principles should also be reflected in national space legislation.[69]

After the creation of the OST in 1967, four main space treaties were adopted, and some of the rules included in these treaties also act as legal resources for the creation of national space legislation.

C. The Other Four Main Outer Space Treaties and National Space Legislation

As mentioned above, after the adoption of the OST in 1967, four other space treaties were created, and these five treaties collectively depict the so-called "space treaty epoch"[70] in the entire legal system of space law. Some regulations in these four treaties can be applied to national space legislation as legal resources.

2001, pp. 1447-1456.

[69] With respect to the basic legal principles of space activities, see: Lafferanderie, Gabriel, *Basic Principles Governing the Use of Outer Space in Future Perspective,* in: Benkoe, Marietta/Schrogl, Kai-Uwe (eds.), Space Law: Current Problems and Perspectives for Future Regulation, Eleven International Publishing, The Hague, 2005, pp. 5-28.

[70] Hobe, Stephan, *Historical Background of the Outer Space Treaty,* in Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume I, Carl Heymanns, Cologne 2009, pp. 16-17.

I. The Rescue Agreement and National Space Legislation

The Rescue Agreement (ARRA) was adopted in 1968; it is essentially an elaboration of Art. V of the OST of 1967.[71] The main purpose of the ARRA is to oblige States to assist astronauts in the event of accident, distress or emergency landing, to prompt them to return astronauts safely, as well as return objects launched into outer space.[72]

Generally speaking, it is possible for the relevant States to provide assistance to astronauts in accident or emergency situations, private entities are not mentioned in the ARRA. When creating national space legislation, the obligation of assistance to astronauts could not be imposed upon private entities. However, as mentioned above, the general understanding of national space law is nowadays more comprehensive than it was before. Domestic space law can be understood in both a "strict sense" and a "broad sense".[73] In other words, in the context of some States' national space legislation, to authorize and continuously supervise the activities of non-governmental entities in outer space is not the sole target. Concerning assistance to astronauts in national space law, for example, in the South Korean "Space Development Promotion Act of 2005", the "rescue of astronauts" is regulated as an obligation of the Korean government.[74] Moreover the details on rescue are similar to those proposed in the ARRA.

The provisions on rescuing space astronauts do not constitute general concerns in national space legislation but, as described above, there are national practices relating to such regulations. In the process of space law-making in China, this issue can be dealt as one of the fundamental principles.

II. The Liability Convention and National Space Legislation

The Liability Convention (LIAB) is generally seen to have been drafted as a supplementary set of rules designed to expand on the provisions of the OST.[75]

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[71] See: Diederiks-Verschoor, I.H.Ph, *An Introduction to Space Law,* Kluwer Law International,The Hague, 1999, pp. 33-34, see also Art. V of the Outer Space Treaty.

[72] See the preamble of the ARRA.

[73] Von der Dunk, Frans, *National Space Legislation,* in: ECSL (ed.), the 11th European Summer Course on Space Law and Policy, 2002, p. 43.

[74] Art. 22 of the South Korean Space Development Promotion Act of 2005.

[75] Smith, Lesley Jane/ Kerrest, Armel, *Art. II of the Liability Convention,* in: Hobe, Stephan/Schmidt-

Moreover, as described above, the possibility of private entities' space activities incurring compensation liability is a reason for States to enact domestic legislation. Thus, the provisions of the LIAB could be an important resource for creating national space law.

1. The Distinction Between Responsibility and Liability in Space Law

(1) International State Responsibility

International State responsibility arises as a consequence of an internationally wrongful act, i.e., a breach of an international obligation arising from an act or omission which is attributable to a State.[76] With respect to the term international responsibility as regulated in Art. VI of the OST, it is commonly accepted that the OST attributes international responsibility to States for national activities in outer space carried out not only by government agencies but also by non-governmental entities, i.e., private firms and individuals, which is a revolutionary advancement of the doctrine of international state responsibility.[77] As has been summarized by Bin Cheng, international state responsibility in the field of outer space arises the moment a breach of an international obligation occurs and not only when the State is seen to have failed in its duty to prevent or repress such a breach, as a State is immediately accountable on the international plane for such a breach in just the same way as if it itself had breached the international obligation.[78] Based on the arguments above, the present author intends to interpret "State responsibility" in Art. VI OST to mean the responsibility of the State to manage and control the space activities of itself and its nationals, i.e., private firms and individuals. Alternatively, one could state that the responsibility of a State to its individual entities in space activities is to ensure the compliance of private enterprises

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Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume II, Carl Heymanns Verlag, Cologne, 2013, p. 119.

[76] Ibid., p. 123, at fn 154.

[77] Cheng, Bin, *Art. VI of the 1967 Space Treaty Revisited: "International Responsibility", "National Activities", and "The Appropriate State",* Journal of Space Law (26) 1998, p. 15. See also: Hermida, Julian, *Legal Basis for a National Space Legislation,* Kluwer Academic Publishers, The Hague, 2004, p. 7.

[78] Cheng, Bin, at p. 15, ibid.

with the provisions of the Outer Space Treaties.[79]

(2) International Liability

According to the analysis of Bin Cheng, the term liability is often used specifically to denote the obligation of bearing the consequences of any breach of a legal duty, in particular, the obligation to make reparations for any damage caused, especially in the form of monetary payment [...]. [80] Furthermore, as regulated in Art. II and Art. III LIAB, the launching State is liable for paying compensation when damage is caused.[81] In this respect, the term "liability" is mainly relevant to the payment of damages to a third party. However, there are three aspects, which are necessary to consider, first, the liability for third-party damages caused by the launching State is to be divided into "absolute liability" and "fault-based liability"; second, the question arises as to whether the LIAB is applicable to non-governmental entities, the space activities of which cause damages to a third party. Thirdly, what is the relationship between the appropriate State and its nationals that participate in space activities when damages to third parties are caused by the relevant activities of the latter?

(a) **Absolute Liability**

Art. II of the LIAB stipulates that:

"A launching State shall be absolutely liable to pay compensation for damage caused by its space object on the surface of the earth or to aircraft flight".[82]

It provides for absolute liability for damage caused on Earth or to aircraft flight, which is considered to be unlimited in amount and independent of territorial location.[83] It is believed that the establishment of "absolute liability"

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[79] Valérie, Kayser, *Launching Space Objects: Issues of Liability and Future Prospects,* Kluwer Academic Publishers, The Hague, 2001, p. 43.

[80] Taken from Ibid.

[81] Art. II and Art. III of the Liability Convention.

[82] Art. II of the Liability Convention.

[83] Smith, Lesley Jane/ Kerrest, Armel, *Art. II of the Liability Convention,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume II, Carl Heymanns Verlag, Cologne, 2013, p. 125.

in the LIAB stems from the following two reasons: one is that the law-makers of the time adopted such a provision in view of the immense risks posed by modern technology, the magnitude of which was and remains largely unknown;[84] the other is that liability under the LIAB lies with States and not with private entities, States generally operate a self-insurance system so that those States involved in space activities are in a position to bear the financial consequences of space-related accidents.[85]

(b) Fault-Based Liability

Art. III of the LIAB states that:

"*In the event of damage being caused elsewhere than on the surface of the Earth to a space object of one launching State or to persons or property on board such a space object by a space object of another launching State, the latter shall be liable only if the damage is due to its fault or the fault of persons whom it is responsible*".[86]

Compared with the notion of "absolute liability" regulated in Art. II, this provision requires that the launching State is liable only when the damage results from fault. More specifically, as concluded by researchers, the sphere of application of Art. III of the LIAB determines whether compensation is to be paid by a launching State as a result of the fault that has led to a collision between its space object(s) and another object or objects in outer space.[87] It is notable that Art. III is applicable to damage caused by collision with another non-functional piece of debris.[88] Concerning the legislation practices of other countries, the mitigation of space debris can be regarded as an important factor to be considered in the process of drafting Chinese space legislation. The requirements of Art. III LIAB should provide a response by considering

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[84] Manfred Lachs, *The Law of Outer Space-An Experiences in Contemporary Law-Making*, Martinus Nijhoff, Leiden, 2010, pp. 115-118.

[85] Smith, Lesley Jane/Kerrest, Armel, *Art. II of the Liability Convention,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume II, Carl Heymanns Verlag, Cologne, 2013, p. 126.

[86] Art. III of the Liability Convention.

[87] Smith, Lesley Jane/Kerrest, Armel, *Art. III of the Liability Convention,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume II, Carl Heymanns Verlag, Cologne, 2013, p. 133.

[88] Ibid.

the legislative practices of other countries, as well as the situation of the space industry of China itself.

With respect to the regulation of Art. III LIAB, especially the term "fault" in this provision, it is also necessary to mention several other arguments. For example, some believe that "the requirement of…fault has led to such critical comments [,such] as [that a case of an] 'in orbit accident will never be dealt with [in a] satisfactory [way]'";[89] "fault has been seen to be ambiguous in the context of space law".[90] Moreover, by way of comparison with Art. II, some researchers propose that the LIAB offers greater protection for people on Earth who are not taking part in the space activity than for those participants acting within the scope of the great space adventure.[91] It is necessary to solve these problems in the future by further interpreting the LIAB or by creating the relevant resolutions. Moreover, in national space legislation, it also necessary to consider some issues mentioned above. For example, the precise criteria for determining the "fault" with regard to activities in the relevant space programs. In the context of national space law, the provision regarding liability is mostly relevant to the relationship of liability between the government and its nationals, so for the purpose of protecting the benefits of States, as well as to promote the development of private space activities, a specific definition of the term "fault", as well as the standards for determining the "fault", are necessary to clarify in national space legislation. In the process of determining the liability for damage with regard to the government and its nationals, an understanding of the term "launching state" must be discussed.

2. **An Understanding of the Term "Launching State"**

According to the regulation under the LIAB, the term "launching State" is relevant to a State that launches or procures the launching of a space object;

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[89] Lyall, Francis /Larsen, Paul B., *Space Law: A Treatise*, Ashgate, Surrey, 2009, p. 108.

[90] Cheng, Bin, *International Liability for Damage Caused by Space Objects,* in: Jasentuliyana, Nandasiri, Lee, Roy S.K. (eds.) Manual on Space Law, Volume I, Ocean Publications, Plymouth, 1979, p. 116.

[91] Smith, Lesley Jane/Kerrest, Armel, *Art. III of the Liability Convention,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume II, Carl Heymanns Verlag, Cologne, 2013, p. 134.

or a State from whose territory or facility a space object is launched.[92] Moreover, the term launching includes attempted launching.[93] The same definition was later accepted by the Registration Convention.[94]

With regard to the definition of the term "launching State", even though there are some conflicting arguments, two aspects can be confirmed. First, there should be no hierarchical order in the allocation of liability according to the four criteria for becoming a launching State;[95] and second, it does not matter whether the related space object or the related launch activity is governmental or non-governmental in nature, in both cases, the qualification as a launching State relies on the State Party responsible for those activities according to Art. VI of the OST.[96] From this point of view, to establish national space legislation, it is necessary to clarify the relationship between the relevant State when acting as a launching State and its private entities participating in space activities.

In the UNGA Resolution of the "application of the concept of 'launching state' 2004", the establishment of national space legislation was recommended.[97] The resolution recommends that States conducting space activities, in fulfilling their international obligations under the UN treaties on outer space, in particular the OST, the LIAB, and the REG, as well as other relevant international agreements, consider enacting and implementing national laws authorizing and providing for continuing supervision of the activities of non-governmental entities under their jurisdiction in outer space.[98]

It is necessary to stress that although national space laws have the

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[92] Art. I of the Liability Convention.

[93] Ibid.

[94] Art. I of the Registration Convention.

[95] Smith, Lesley Jane/Kerrest, Armel, *Art. I of the Liability Convention,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume II, Carl Heymanns Verlag, Cologne, 2013, pp. 108-109. See also: Schmidt-Tedd, Bernhard *Art. I of the Registration Convention*, in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume II, Carl Heymanns Verlag, Cologne, 2013, pp. 244-247.

[96] Schmidt-Tedd, Bernhard, ibid., at p. 245.

[97] With regard to the commentary on the 2004 LS Resolution, see: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), *Cologne Commentary on Space Law, Volume III,* Carl Heymanns Verlag, Cologne, 2015, pp. 368-400.

[98] Paragraph I, LS Resolution of 2004.

capacity to provide a satisfactory link between the obligations enshrined in the treaties and space activities carried out by non-governmental entities, State respond to their own political context and economic needs when actually enacting such national laws.[99] In view of this, it is probable that competitive imbalances or even conflicts will be created between different States.[100] Consequently, Paragraph 4 of the LS Resolution of 2004 recommends a harmonization of State practices in implementing treaty obligations.[101] In other words, for the purpose of the present research, when discussing the drafting of national space legislation for China, the following three issues must at least be considered: firstly, how should this national law of China link the obligations of the space treaties, which China ratified, with the space activities of its private space entities; secondly, to what extent should the demands of national benefits and security be considered; and thirdly, how should such national laws grant sufficient flexibility to harmonize with the regulations of the other space-faring nations. As China itself is a country which has advanced space capacities, and meanwhile, China is a country that is different from many other space-faring States in the aspect of conducting cooperation programs in outer space (e.g. The program of the Space Station),[102] thus in the process of creating Chinese space law, future harmonization with the other space-faring countries' national space laws must be considered.

3. The Situation of Joint Launch in the Context of the LIAB

Whenever two or more States jointly launch a space object, they shall be jointly and severally liable for any damage caused.[103] A launching State, which has paid compensation for damage, shall have the right to present a claim for indemnification to other participants in the joint launching. The

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[99] Aranzamendi, Sanchez M./Riemann, Frank/Schrogl, Kai-Uwe, *Paragraph 1 of the 2004 LS Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p. 384.

[100] Ibid.

[101] Ibid.

[102] With respect to the specific introduction of Chinese space cooperation, see: China National Space Administration, *Facts& Information,* available at: http://www.space.com/22743-china-national-space-admininistration.html.

[103] Art. V of the Liability Convention.

participants in a joint launching may conclude agreements regarding the apportioning of the financial obligation in respect of which they are jointly and severally liable amongst themselves.[104]

Regarding the specifics of the legal significance of such regulation of joint and several liabilities, scholars have already made relevant illustrations,[105] the present paragraph emphasizes joint liability in national space legislation.

With the rapid development of space commercialization and privatization, it is assumed that joint space projects launched by private entities from different States could be possible in the near future, in this case, it would be necessary for national space legislation to take measures to deal with the issues of joint and several liability. However, it is notable that the apportioning of liability in the situation of a joint launch is mainly relevant to launching States, and it is also recommended by the LIAB, as well as the 2004 UNGA LS Resolution to enact an agreement between States which participate in the joint launch.[106] Thus, the obligations of private entities on this issue are mainly based on the considerations of the relevant launching States. In other words, the protection of national benefits, as well as potential agreements with other States that jointly participate in the launching activities, should be the most important criteria.

4. No Application to Nationals and Foreign Participants in the Launching States

The provision of the LIAB shall not apply to damage caused by a space object of a launching State to: (a) nationals of that launching State; and (b) foreign nationals during such time as they are participating in the operation of that space object from the time of its launching or at any stage thereafter until its descent, or during such time as they are in the immediate vicinity of a planned launching or recovery area as the result of an invitation by that launching

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[104] Ibid.

[105] Smith, Lesley Jane/Kerrest, Armel, *Art. V of the Liability Convention,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume II, Carl Heymanns Verlag, Cologne, 2013, pp. 141-147.

[106] Ibid.

State.[107]

As this group of people, when subject to damage, is excluded from the application of the LIAB, in order to better protect their benefits, relevant regulations can be set up in national space law. There are different practices in different countries.[108] Furthermore, in the process of creating China's space law, these practices are necessary to consider.

In short, Art. VI OST stipulates that the appropriate State is liable for the activities of its nationals when causing damage to third parties. Moreover, this regulation is the main motivation for space-faring nations enacting national space regulations. In the LIAB, the relevant liabilities are specifically illustrated. From this point of view, the provisions in the LIAB should be the main resources of domestic space law. Additionally, as noticed in the LS Resolution of 2004, the establishment of national space law is not only influenced by international obligations, but also affected by the consideration of national benefits, so it is possible for different countries to enact conflicting provisions on the same international obligation. Considering that international cooperation may be a trend in the development of space activities in the future, it is meaningful to consider the harmonized approach of various national space legislation. In the law-making process of Chinese space law, the aforementioned issues must be comprehensively considered.

III. The Registration Convention and National Space Legislation

The UNGA adopted the Convention on Registration of Objects Launched into Outer Space (REG) in the year 1974.[109] The purpose of this Convention is to achieve transparency in space activities[110] and the drafters of this convention believe that "a mandatory system of registering objects launched into outer space would, in particular, assist in their identification and would contribute

[107] Art. VII of the Liability Convention.

[108] Several bodies of national space legislation have classified the purchase of third-party compulsory insurance as the precondition of launching activities. See: (Smith, Lesley Jane/Kerrest, Armel, *Art. V of the Liability Convention,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume II, Carl Heymanns Verlag, Cologne, 2013, p. 153, at fn 267).

[109] Convention on Registration of Objects Launched into Outer Space.

[110] Jakhu, Ram S. /Jasani, Bhupendra/ McDowell, Jonathan C., *Critical Issues Related to Registration of Space Objects and Transparency of Space Activities*, Acta Astronautica (143) 2018, p. 406.

to the application and development of international law governing the exploration and use of outer space".[111]

Specifically, the REG consists of twelve provisions and this convention basically stipulates the following aspects regarding the registration of space objects, i.e., (1) the definitions of the basic terms, which should be applied in this Convention, for example, the terms "launching State", "space object" and "State of registry";[112] (2) the obligations for States and for the UN Secretary-General to maintain an appropriate registry;[113] and (3) the requirements for registration.[114]

Pertaining to the national registration of space objects, Article II of the Registration Convention imposes three obligations on each State Party that is a launching State, (1) to establish and maintain an appropriate national registry of space objects; (2) to record in the registry its space objects that have been launched into Earth orbit or beyond; and (3) to inform the UN Secretary-General of the establishment of such a registry. The contents and conditions are matters subject to the discretion of each State Party.[115]

It is necessary to mention that national law-makers can take the definitions in the REG as a reference to create more comprehensive and clear definitions. Following the example of the LIAB, the REG starts in Art. I by providing definitions of the terms "launching State", "space object" and "space registry".[116] These definitions can be legal resources for national space law. However, it is notable that the definitions given by the REG are considered to be a modest start, especially because the definition of "space object" is neither clear nor satisfactory.[117]

From when the REG was adopted to date, activities in outer space have rapidly developed. The developments include, for instance, the continuous

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[111] Preamble of the Registration Convention.
[112] Art. I of the Registration Convention.
[113] Art. II and Art. III of the Registration Convention, see also: Diederiks-Verschoor, I.H.Ph, *An Introduction to Space Law,* Wolters Kluwer, The Hague, 2008, p. 47.
[114] Art. IV of the Registration Convention.
[115] Art. II of the Registration Convention.
[116] Diederiks-Verschoor, I. H. Ph, *An Introduction to Space Law,* Wolters Kluwer, the Hague, 2008, p. 47.
[117] Ibid.

development of new technologies, an increase in the number of States carrying out space activities, an increase in international cooperation in the peaceful uses of outer space and an increase in activities carried out by non-governmental entities, as well as partnerships formed by non-governmental entities from more than one country.[118] However, the REG seems to have not achieved its purpose with criticsm on the much too late furnished information, furnished information is often so general that it may not be as helpful in creating transparency as had been hoped by the drafters, and the number of registrations of space objects is declining etc.[119]

In order to improve this unsatisfactory situation and realize the purpose of space object registration, in the year 2007, the UNGA adopted the resolution "Recommendations on Enhancing the Practice of States and International Intergovernmental Organizations in Registering Space Objects (RegPract Resolution)".[120] New developments of space activities associated with registration are primarily referred to. For example, in the case of a change in the supervision of a space object, its international registration would also be needed to be changed by subsequently notifying the UN under the Registration Convention. Although the UNGA resolution is not legally binding, States, as well as inter-governmental organizations which participate in space activities, are free to accept the RegPract Resolution. These detailed recommendations are of value when making a national registry as they have been listed as basic requirements in the Registration Information Submission Form of the UNOOSA.

IV. The Moon Agreement and National Space Legislation

The creation and adoption of the Moon Agreement (MOON) is considered to be the end of the space treaty epoch,[121] and after the failure of the MOON,

[118] Preamble, UNGA Res. 62/101, The 2007 Resolution on Recommendations on Enhancing the Practice of States and International Intergovernmental Organizations in Registering Space Objects, 17 December 2007.

[119] Jakhu, Ram S. /Jasani, Bhupendra/ McDowell, Jonathan C., *Critical Issues Related to Registration of Space Objects and Transparency of Space Activities*, Acta Astronautica (143) 2018, p. 406.

[120] UNGA Res. 62/101, The 2007 Resolution on Recommendations on Enhancing the Practice of States and International Intergovernmental Organizations in Registering Space Objects, 17 December 2007.

[121] With respect to the discussion of the different epochs of space law development, see: Hobe, Stephan,

the new epoch of the "UNGA Resolution" was opened up.[122] The "Agreement Governing the Activities of States on the Moon and other Celestial Bodies" was adopted in 1979, and as mentioned in the preamble of this treaty, its adoption was based on considering "the need to define and develop the provisions of international instruments in relation to the moon and other celestial bodies, having regard to further progress in the exploration and use of outer space".[123] The MOON consists of 21 provisions and in addition to regulating the basic principles of exploring the Moon, the treaty also describes the basic legal framework for utilizing lunar natural resources; moreover, the establishment of a regime for lunar resource exploitation was also assumed.[124] However, due to the limitation of the famous legal principle of the "common heritage of mankind", to date, only 17 States have ratified the treaty,[125] which is far less than the number of State Parties of the other UN space treaties, which is currently in the region of 50 to 100.[126] Furthermore, among the member States of the MOON, no state party could be considered as a space power. This can also be seen as the failure of this treaty.

Although the MOON is not an international treaty which was ratified by many states as the other four main treaties are, the issue of natural resource exploitation on the Moon and other celestial bodies proposed by it must be focused on by States when making national space legislation, especially China as a space-faring country. From the perspective of national practice, a new trend is embodied by the United States' Space Act of 2015, which

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Historical Background of the Outer Space Treaty, in: Cologne Commentary on Space Law, Volume I, Carl Heymanns, Cologne 2009, pp.15-16. See also: Nie, Mingyan, *Legal Framework and Basis for the Establishment of Space Cooperation in Asia,* Lit Verlag, Muenster, 2016, pp. 51-53.

[122] Ibid.

[123] Preamble of the Moon Agreement.

[124] See: Art. 11 of the Moon Agreement.

[125] See: Status of International Agreements relating to activities in outer space as at 1 January 2017, available at: http://www.unoosa.org/documents/pdf/spacelaw/treatystatus/AC105_C2_2016_CRP03E.pdf.

[126] Hobe, Stephan/Stubbe, Peter/Tronchetti, Fabio, *Historical Background and Context of the MOON,* in Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume II, Carl Heymanns, Cologne, 2013, p. 336. With respect to the specific number of member states of space treaties, see also: Status of International Agreements relating to activities in outer space as at 1 January 2017, available at: http://www.unoosa.org/documents/pdf/spacelaw/treatystatus/AC105_C2_2016_CRP03E.pdf.

includes a range of legislative changes intended to boost the US space industry.[127] Furthermore, the most significant parts thereof are measures allowing US citizens to engage in the commercial exploration and exploitation of "space resources", including water and minerals as examples.[128] Luxembourg also adopted a similar law in July 2017. More details will be discussed in Chapter III of the present research.

D. International Telecommunication Law and National Space Legislation

Besides the five international space treaties analyzed above, in the process of national space legislation, certain regulations provided by the International Telecommunication Union (ITU) should not be ignored. The ITU is the singular international body providing substantive and obligatory international standards for national space activity.[129] The ITU's role is to maintain and extend international cooperation between its 191 Member States for the improvement and rational use of telecommunications of all kinds.[130] In general terms, the ITU strives to work on the main issues involved in international telecommunications, notably including- as far as the various telecommunication modes involving radio waves are concerned - minimizing unintentional cross-border interference by various technical and legal means.[131] The ITU forum is used by the international community to address broader issues, such as making communications more widely available, increasing the security of transmissions in the interests of cyber security, and developing life-saving communications for wide impacting events such as natural disaster.[132] However, with respect to the establishment of national space regulations, the ITU, as well as the regulations for telecommunication,

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[127] See: http://www.wired.co.uk/news/archive/2015-11/12/how-to-mine-asteroids-for-fun-and-profit.
[128] Ibid.
[129] Spencer, Ronald L. Jr., *International Space Law: A Basis for National Regulation,* in: Jakhu, Ram S. (eds.), National Regulation of Space Activities, Springer, Dordrecht, Heidberg, London, New York, 2010, p. 13.
[130] Ibid.
[131] Von der Dunk, Frans/Tronchetti, Fabio (eds.), *Handbook of space law,* Edward Elgar Publishing, Cheltenham, 2014, p. 464.
[132] Secretary-General Hamadoun. Toure (Address to the International Telecommunication Union in Cairo, Egypt, 11 May 2008). See also: Spencer, Ronald L. Jr., *International Space Law: A Basis for National Regulation,* in: Jakhu, Ram S. (ed.), National Regulation of Space Activities, Springer, Dordrecht, Heidberg, London, New York, 2010, p. 14.

is relevant for the following two reasons:

Firstly, Art. 44 (2) of the Constitution of the ITU regulates that:

"*In using frequency bands for radio services, Member States shall bear in mind that radio frequencies and any associated orbits, including the geostationary-satellite orbit, are limited natural resources and that they must be used rationally, efficiently and economically, in conformity with the provisions of the Radio Regulations, so that countries or groups of countries may have equitable access to those orbits and frequencies, taking into account the special needs of the developing countries and the geographical situation of particular countries*".[133]

In order to ensure that the relevant Member States of the ITU comply with the basic legal principle mentioned above, relevant standards, which are expressed through the Administrative Regulations of the ITU, have been created. The Member States are obliged to confirm their use and supervision of the radio frequency spectrum to these regulations.[134] Moreover, all frequency assignments are made by the Member States' national administration by way of coordination with the Radio Communication Bureau at the ITU.[135] The Member States must require that their private entities operate in accordance with the Radio Regulations.[136] The telecommunication regulation is relevant to national space law when such private entities act as the applicants using the limited resources of the frequency bands of radio services. In this situation, it is necessary for States to enact regulations in national legislation to clarify the preconditions and the procedures for private entities applying to use the frequency bands.

Secondly, Art. 18 (1) of the Radio Regulations of the ITU stipulates that:

"*No transmitting station may be established or operated by a private person or by any enterprise without a license issued in an appropriate form and in conformity with the provisions of these Regulations or on behalf of the*

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[133] Art. 44 (2) of the ITU Constitution.

[134] Spencer, Ronald L. Jr., *International Space Law: A Basis for National Regulation,* in: Jakhu, Ram S. (ed.), National Regulation of Space Activities, Springer, Dordrecht, Heidberg, London, New York, 2010, p. 14.

[135] Ibid, p. 15, at footnote 94.

[136] Ibid. P. 15, at footnote 95.

government of the country to which the station in question is subject."[137]

This provision is applicable to the private entities that intend to establish transmitting stations. Furthermore, under these circumstances, States are required to establish domestic regulations that administrate the activities of the applicants creating transmitting stations. Accordingly, the preconditions and relevant procedures of private entities applying to create transmitting stations should be provided for in domestic regulations.

When dealing with the legal issues regarding telecommunication activities, national laws are required to clarify the preconditions and procedures for private entities to apply to utilize the frequency band and create transmitting stations. In this regard, national regulations have to, on the one hand, protect the benefits of the private entities and, on the other hand, coordinate the relationship with ITU regulations and standards.

In conclusion, the 1967 OST created the basic legal principles for the exploration and exploitation of outer space, including the moon and the other celestial bodies. Moreover, the other four space treaties were established to further interpret the relevant legal principles which were proposed in the OST. Concerning the creation of national space legislation, there is no mandatory obligation in the international treaties requiring the member States to enact their own space regulation for managing the activities of their nationals. However, the regulation in Art. VI of the OST motivates the member States to do so. Furthermore, the main rules of the OST, the other four international space treaties (especially the LIAB and the REG), as well as the regulations provided by the ITU, can be taken by national space law as legal resources. From the above analysis, one can summarize that national space legislation seems to be mainly applied as an instrument to facilitate the performance of the obligations of the international treaties. However, it is necessary to point out that the significance of making national space law is far greater than the significance of implementing international obligations. In the next paragraph, the other factors rendering enacting domestic space legislation necessary will be introduced.

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[137] Art. 18 (1) of the Radio Regulations of the ITU.

E. The Necessity of National Space Legislation

The starting point for creating national space legislation at the beginning is to effectively authorize and continuously supervise private space activities in order to confirm that space activities of the non-governmental sectors are conducted in accordance with the regulations of the international treaties. However, it is notable that the space treaties were drafted when States were the only players in outer space, no consideration was given to the commercial side of space activities,[138] private actors were long excluded from the playground. In the first decades of space flight, private space activities remained a rather theoretical issue.[139] On the one hand, due to strategic and political reasons, governments were hesitant to allow anyone other than their own military or governmental space agencies to be involved in space-related affairs. On the other hand, the enormous financial commitments required to undertake any kind of operation in space deterred potential private investors from entering the space sector.[140] Nevertheless, major changes occurred towards the end of 20th century because of various political, economic and technical developments. The fall of communism, increasing liberalization and globalization of the economy and remarkable progress in electronics and other industries paved the way for private enterprises and other non-governmental entities to explore and use outer space.[141] Outer space is no longer a playground reserved only for nation states. In the year 1997, for the first time, private sector space revenues exceeded governmental space expenditures, and the number of commercial payloads launched into space exceeded the number of government payloads.[142] The treaties are decades

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[138] Zhao, Yun, *Space Commercialization and the Development of Space Law from a Chinese Legal Perspective*, Nova Science, Hauppauge, New York, 2009, p. 138.

[139] Marboe, Irmgard, *Introduction and Context of the 2013 NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p. 494.

[140] Tronchetti, Fabio, *Fundamentals of Space Law and Policy,* Springer, Cham, 2013, p. 25.

[141] Marboe, Irmgard, *Introduction and Context of the 2013 NatLeg Resolution,* in Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p.494.

[142] Federal Aviation Administration, Associate Administrator for Commercial Space Transportation, "Commercial Space Transportation: 1997 Year in Review", (Janurary 1998.): see also: Vedda, James A., *Space Commerce,* in: Eligar Sadeh (ed.), Space Politics and Policy: An Evolutionary Perspective,

old and are outdated. Not only have national priorities moved on since the treaties were first created, but the treaties also did not anticipate the extent to which private companies would now take part in space activities. The international legal regime has so far failed to accommodate technical, political and commercial progress.[143] Under such circumstances, the legal framework to regulate private activities in space was largely inadequate.[144]

Outer space is full of opportunities. However, the lack of a clear legal framework prevents potentially interested parties from taking advantage of the opportunity for economic and technical gains.[145] If all of the legal issues regarding private participation in space activities could be clarified by national regulations, it would prevent private investors hesitating in contributing to space affairs, and finally provide a sound legal environment to develop space industry.[146]

The size of the space economy is far larger than many people may think. In 2015 alone, the global market amounted to $323 billion.[147] Additionally, the commercial infrastructure and systems accounted for 76 percent of that total. It can be hard to fathom how space benefits national economies.[148] Commercialization of space activities has become a general trend in many fields, which are relevant to space activities, not limited in the telecommunication and remote sensing field as it was a few years ago. It has spread to launch and associated services, the international space station, space tourism etc. Commercialization of space activities requires a legal framework for private investors and entrepreneurs in order to promote and develop this sector of industry into a fully-fledged commercial enterprise. Apart from the already existing international public legal framework of space law, rules should be created to provide a level playing field for all interested parties.

Kluwer Academic Publishers, Dordrecht, Boston, London, 2002, p. 215.

[143] Lothian, Jennifer, *The Commercialization of Space,* the Journal of Law Society of Scotland (1) 2017, available at: http://www.journalonline.co.uk/Magazine/62-1/1022697.aspx.

[144] Tronchetti, Fabio, *Fundamentals of Space Law and Policy,* Springer, Cham, 2013, p. 25.

[145] Ibid., at pp. 138-139

[146] Ibid.

[147] The Space Foundation, *The Space Report: 2016*, available at: https://www.spacefoundation.org/news/space-foundation-report-reveals-global-space-economy-329-billion-2016.

[148] Hampson, Joshua, *The Future of Space Commercialization,* Niskane Center Research Paper (1) 2017, p. 3.

These rules should point to the transparency of risks and liabilities and the liberalization of the various space market segments.[149]

The growing involvement of non-governmental entities in different space projects has strengthened the role of national space law as an instrument to ensure that all space activities are carried out not only in conformity with the obligations arising from international space treaties but also to provide a sound environment for private sectors to play a key role in commercial space activities, and finally contribute to the optimization of the utilization of outer space. Thus, the regulations in national space legislation related to private and commercial space activities should be much more comprehensive. Furthermore, for China, the current situation is that the privatization of space activities is very limited and impeded by the government. This will deter the competence and development of China's space industry in the long run. Hence, it is urgent for China to encourage and promote the private sector participating in space activities from the perspective of the legal system. Moreover, legal issues brought about by commercialization, like regulations on contracts and insurance and the protection of intellectual property rights, should also be thoroughly considered. These topics will be further illustrated in Chapter V of the present research.

F. Chapter Conclusion

This chapter clarifies the driving force behind States enacting national space legislation. The main legal contents, which should be embodied in the context of national space legislation, are to be identified as deriving from the articles of the main space treaties. Authorization, with detailed considerations and continuous supervision of space activities, insurance requirements, indemnification procedures, a register of space objects etc. should be the main provisions of national space legislation. Furthermore, the non-appropriation of outer space, assistance to astronauts and environmental protection should be the basic national legal principles.

The existing body of international space regulations prompts States to

[149] Ibid.

enact national space legislation in order to cope with their obligations under these space law regulations and to organize their (non-)governmental space activities. The growth of the space market and the increasing participation of private actors in the commercializing space sector has sparked a growing interest in pursuing more State regulations, which are seen as a necessity for national space legislation.

When China is making its national space legislation, it should be held in mind that, first, obligations laid down by the international space treaties should be implemented. Second, China's national space legislation should keep up with the pace of the privatization and commercialization of space development. An explicit and predictable legal framework should be provided for the private actor to faithfully participate in the space activities. In the meantime, the legal framework should leave sufficient room for flexibility in order to deal with the progressive changes taking place in commercial space industries.

Chapter II. The Basic Content of National Space Legislation: A Conclusion Based on State Practice

As discussed in the first chapter, international space treaties motivate States to enact national space legislation. With the commercialization and privatization of space activities, the number of States and private space actors involved in space activities has considerably increased. As more national space regulations emerge, there seems to be an on-going regulatory competition between states to attract investment within their borders through the incentives of lowering levels of authorizations for space activities and insurance requirements.[150] It seems advisable that some aspects belonging to a State's national discretion should be harmonized among States to create a fair and competitive environment, as well as to avoid "license shopping" tendencies.[151] In the light of such a background, several initiatives, both in academia and within the United Nations, took place to approach the issue, and the results of these initiatives largely concurred on one point, which is the need for appropriate legislation on space activities at the national level. The question was also raised as to what extent it would be desirable and feasible to achieve a certain degree of uniformity or harmonization.[152] The common conclusions drawn by the international initiatives formulates the basic content of existing national space legislation, which can provide a major reference for States in pursuing national space legislation.

A. National Space Legislation: A Brief Introduction to the Existing National Practice

As early as 1969, the "Act on Launching Objects from Norwegian Territory

[150] Paul Stephen Dempsey, *National Laws Governing Commercial Space Activities: Legislation, Regulation, & Enforcement*, Northwestern Journal of International Law & Business, Vol. 36, 2016, p. 43.
[151] Gerhard, Michael, *National Space Legislation - Perspectives for Regulating Private Space Activities,* in: Benkoe, Marietta/Schrogl, Kai-Uwe (eds.), Space Law Current Problems and Perspectives for Future Regulation, Eleven International Publishing, the Netherlands, 2005, p. 84.
[152] Marboe, Irmgard/Aoki, Setsukoi, *Introduction and Context of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p. 494.

into Outer Space"[153] was adopted by Norway, which is the first national space legislation in the world. Thereafter, more than 20 States[154] have adopted national legislation in various forms, e.g., law, decree and regulation, etc. to regulate certain aspects pertaining to space activities.[155]

By conducting an overview of existing national space legislation, a remarkable diversity in their scope, extent and approach can be easily identified. The reason for this diversity is that States have enacted national legal frameworks in respect of their specific needs and practical considerations and often closely corresponding to the type of space activities conducted.[156] Furthermore, the degree of commercialization and privatization of the space sector in the respective country plays an important role.[157]

The regulations dealing with space activities in national space legislation could be generally classified into the following four categories:

1) National regulations on establishing the basic legal principles and measures of space activities. The Basic Space Law (BSL)[158] of Japan adopted in 2008 is one example. The BSL aims to realize the basic principles, clarify the state's responsibility and establish the strategic headquarters to promote measures with regard to space development and use.[159] It has constructed the basic legal structure for the development of space activities by its non-governmental entities.

2) National regulations on granting a competent national authority or

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[153] Act on Launching Objects from Norwegian Territory into Outer Space, No. 38, 13th June 1969.

[154] For more specific information on national space regulation, please see the conclusion by the United Nations Office for Outer Space Affairs, National Space Law Collection, online at: http://www.unoosa.org/oosa/en/ourwork/spacelaw/nationalspacelaw/index.html.

[155] For a conclusion on the national space regulations of the main States, see: Aoki, Setsuko, *Practical Background of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p. 503. When discussing this issue, in the present research, national regulations were selected, not all laws listed by Aoki are accepted in this analysis as "national regulations". In the introduction of this paragraph, only the name and the other primary information on the domestic laws are summarized, other specific rules will be analyzed when necessary in the following discussions.

[156] Marboe, Irmgard, *National Space Law,* in: Von der Dunk, Frans/Tronchetti, Fabio (eds.), Handbook of Space Law, Edward Elgar Publishing Limited, Cheltenham, 2015, pp.183-184.

[157] Ibid.

[158] Japanese Basic Space Law, Act No. 43/2008, 27 August 2008.

[159] Art. 1 of the Japanese 2008 Basic Space Law.

authorities, which grant authorization and provide for the conditions and procedures for granting, modifying suspending or revoking the authorization [160] or play an important role in the decision to grant authorizations. This kind of regulation is always relevant to the creation of a national space agency, which is in charge of the private space sector. Moreover, the functions of the agency, as well as its relationship with other national administrations, are normally fundamental content in this kind of regulations. For example, in 2010, Nigeria adopted the "National Space Research and Development Agency Act".[161]

3) National regulations on the authorization and continuous supervision of non-governmental space activities and the registration of space objects. This kind of regulations make up the majority of national space legislation and the legal instruments chosen by the States are diverse.

4) National regulations addressing the operation of remote sensing satellite and /or the data policy. This kind of regulations mainly concern the utilization, dissemination, transmission and distribution of satellite data in different fields. In 1984, the USA adopted the "Land Remote Sensing Commercialization Act"[162] and in 1992 it adopted the "Land Remote Sensing Policy Act".[163] Both acts are now codified in the "National and Commercial Space Programs".[164] After the USA, in 2005, Canada adopted the "Remote Sensing Space Systems Act", and in the year 2007, the "Remote Sensing Regulations"[165] was established. Germany also enacted its "Satellite Data

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[160] Aoki, Setsuko, *Practical Background of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p. 514.

[161] The Nigerian statute can be found at: http://nass.gov.ng/document/download/5892.

[162] The Land Remote Sensing Commercialization Act 1984 (USA), "H.R. 4836 - 98th Congress. For a more detailed analysis of this Act, please see: DalBello, Richard, *The Land Remote Sensing Commercialization Act of 1984,* Space Policy (1) 1985, pp. 289-297.

[163] Land Remote Sensing Policy Act 1992 (USA), H.R.6133 - 102nd Congress, for a more detailed analysis of this Act, please see: Gabrynowicz, Joanne Irene, *The Promise and Problems of the Land Remote Sensing Policy Act of 1992,* Space Policy (9) 1993, pp. 319-328.

[164] For more details, please see: Cornell Law School, Law Information Institute, *U.S. Code-Title 51 National and Commercial Space Programs,* online at: https://www.law.cornell.edu/uscode/text/51 The text of this law is available at: http://laws-lois.justice.gc.ca/eng/regulations/SOR-2007-66/page-1.htmL.

[165] The text of these regulations is available at: http://laws-lois.justice.gc.ca/eng/regulations/SOR-2007-66/page-1.htmL

Security Act (SatDSIG)".[166]

Some States choose to include all the regulations discussed above and combine various legal instruments to formulate a comprehensive dedicated legal regime, the USA is a prominent example. Some only focus on one type, for example, German space legislation for now only targets remote sensing data. Some even focus on one specific part of one type, for example, Spain merely has a decree on a national registry.[167]

B. The ILA Model Law and the NatLeg Resolution

Although existing national space legislation is largely different, a fact should not be forgotten is that many of the main elements of national space legislation stem from the international space law treaties.

I. An Overview of the ILA Model Law

In view of existing national space legislation, the International Law Association (ILA),[168] a non-governmental international organization of lawyers which has a specific committee on space law,[169] found it necessary and useful to come up with a proposal for model national legislation.[170] Its special committee started the work of proposing a national model law as early as 2006 at the Toronto conference. Then, the work was continued in 2008 and 2010 at the conferences of Rio de Janeiro and the Hague. The first Model Law proposed consisted of nine articles. Consultations continued until the 2012 Sofia Conference, where a revised draft was presented by the rapporteur under the title 'Draft Guidelines for a Model Law on National Space Legislation'.[171] The new draft consists of 14 articles and reflects the intensive

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[166] A general introduction of the SatDSIG can be found at: http://www.unoosa.org/pdf/pres/lsc2010/tech-02.pdf, see also: Schmidt-Tedd, Bernhard, *The SatDSiG –German Satellite Data Security Act,* available at: https://www.gwu.edu/~spi/assets/docs/PPP_DLR_SatDSiG-Datenpolicy_Bernhard.pdf.

[167] Spain, Royal Decree No.278/1995 establishing in the Kingdom of Spain the Registry foreseen in the Convention adopted by the United Nations General Assembly on 2nd November 1974, 24 February 1995.

[168] For details see: http://www.ila-hq.org/index.php/about-us/aboutus2.

[169] For details regarding the ILA Space Law Committee, see: http://www.ila-hq.org/index.php/committees.

[170] Hobe, Stephan, *The ILA Law for National Space Legislation,* German Journal of Air and Space Law (1), 2013, p. 88.

[171] Marboe, Irmgard, *National Space Law,* in: Von der Dunk, Frans/Tronchetti, Fabio (eds.), Handbook

exchange of views and proposals between members of the Committee,[172] based on existing State practice.

Art. 1 of the ILA Model Law deals with the scope and jurisdiction of national space law. [173] This provision intends to clarify a specific link that exists for the respective country, which enacts the specific law.[174] Definitions of "space activity", "commercial space activity", "space object", "operator", "authorization" and "supervision"[175] are provided in Art. 2. These definitions can be used for reference by the States that have not yet enacted domestic legislation. However, it is widely believed that the list is not exhaustive, national legislators are free to add more definitions if they consider it necessary.[176] Art. 3 and Art. 4 target authorization and the conditions of authorization. Art. 5 stipulates that all space activities should be subject to supervision by the minister, and mentions that details of supervision will be laid down in an implementing decree/regulation.[177] If the conditions of Art. 4 (1) and (3) are not complied with, the minister can take measures to withdraw, suspend or amend the authority regulated in Art. 6.[178] Art. 7 and Art. 8 are both related to the protection of the environment with regard to space activities. Art. 7 requires the applicants of space activities to submit an environmental assessment for obtaining authorization to conduct space activities, and Art. 8 requires that any space activities should avoid the production of space debris. More specifically, the environmental assessment regulated in Art. 7 includes the aspects of both the Earth and outer space, and the space debris issue mentioned in Art. 8 is mainly relevant to the space environment. With respect to the mitigation of space debris, international standards have been established.[179] Art. 9 concerns the transfer of a space

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of Space Law, Edward Elgar Publishing Limited, Cheltenham, 2015, p. 182.

[172] Ibid.

[173] Art. 1-Scope of Application, of the ILA Model Law.

[174] See: Hobe, Stephan, *The ILA Law for National Space Legislation,* German Journal of Air and Space Law (1), 2013, p. 88.

[175] Art. 2-Definitions-Use of Term, of the ILA Model Law.

[176] Hobe, Stephan, *The ILA Law for National Space Legislation,* German Journal of Air and Space Law (1), 2013, pp. 86-87.

[177] Ibid.

[178] Art. 6-Withdrawal, Suspension or Amendment of Authorization, of the ILA Model Law.

[179] For example, the IADC Space Debris Mitigation Guidelines.

activity. It states that if and when transferring the space activity to another operator, the operator has to be proved to fulfill the same conditions under Art. 4.[180] For the purpose of ensuring the safety of outer space activities, this provision is significant. Art. 10 specifies the content of registration and the situation in which there is more than one launching State is also considered,[181] which is very important for the promotion of commercial space activities. Art. 11 confirms the rights of States to obtain recourse from the operators after compensating the damaged parties; meanwhile, this article also proposes that such recourse by the government may be limited up to a certain amount, which intends to protect the benefits of private operators and to promote their participation in space activities. The regulation of insurance is included in Art. 12. Space operators purchasing third-party insurance is set up as the condition to obtain authorization, and the provision here attempts to clarify more details, for example, the level of insurance, and the situation in which the insurance provision is not applicable. It is necessary to point out that Art. 12 waives the obligation if the operator has sufficient equity capital to cover the amount of his/her liability.[182] Procedural issues and the settlement of disputes are considered in Art. 13. The situation of sanctions is regulated in Art. 14, the measure of punishment by way of a fine is proposed.

The ILA Model Law takes the position in favor of specific solutions and uses very clear language.[183] It is believed that it will serve as a point of reference to be used by States as a starting point for their national drafting efforts.[184] In the following discussion, the ILA Model Law will be taken as a major standard of national space legislation, and its specific provisions will be elaborated upon when necessary.

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[180] Art. 9-Transfer of Space Activity, of the ILA Model Law.

[181] Art. 10 (3) of the ILA Model Law.

[182] Art. 12 (3)-a) of the ILA Model Law.

[183] Marboe, Irmgard, *National Space Law,* in: Von der Dunk, Frans/Tronchetti, Fabio (eds.), Handbook of Space Law, Edward Elgar Publishing Limited, Cheltenham, 2015, p. 184.

[184] Hobe, Stephan, *The ILA Law for National Space Legislation,* German Journal of Air and Space Law (1), 2013, p. 95.

II. A General Introduction of the Resolution on Recommendations on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space (NatLeg Resolution)

In the year 2004, the Legal Sub-Committee of the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) adopted a resolution "Application of the Concept of the 'Launching State'" (LS Resolution).[185] A number of recommendation for member states are contained in the LS Resolution, with a particular view to enacting national space legislation.[186] Thereafter, other resolutions, which are indirectly relevant to national space legislation, were adopted: for example, the "Recommendations on Enhancing the Practice of States and International Intergovernmental Organizations in Registering Space Objects".[187] No later than 2007, the Legal Committee of the UNCOPUOS decided to put the "General exchange of information on national legislation relevant to the peaceful exploration and use of outer space" as a new item on its agenda.[188] After a four-year plan of the workshop,[189] the draft of the NatLeg Resolution was adopted by the Special Political and Decolonization Committee (Fourth Committee) of the UNGA on 11 December 2013 without a vote.[190] It is notable that this Resolution was established on the basis of the full exchange of opinions between different countries on national space legislation, and it intends to act as a reminder of what should not be forgotten in the process of drafting national space legislation.[191]

Except for the preface part, the NatLeg Resolution consists of 8

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[185] UNGA Res. 59/115, Application of the Concept of the "Launching State", 10 December 2004.

[186] Marboe, Irmgard, *Paragraph 1 of the National Space Legislation Resolution, Recommendation: Scope of Application,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p. 536.

[187] Ibid., p. at 537. See also: UNGA Res. 62/101, The 2007 Recommendations on Enhancing the Practice of States and International Intergovernmental Organization in Registering Space Objects, 17 December 2007.

[188] Ibid., at p. 538.

[189] Ibid.

[190] Ibid., at p. 545.

[191] Marboe, Irmgard, *Paragraph 1-Recommendation: Scope of Application, of the NatLeg Resolution, in*: Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p. 546.

paragraphs. The general content of it can be summarized as follows:[192]

Paragraph 1 points out that space activities are targeted by national regulatory frameworks. Moreover, a description of space activities is undertaken. In paragraph 2, States are required to ascertain national jurisdiction over space activities carried out from a territory under its jurisdiction and/or control; likewise, States are further required to issue authorizations to qualified private entities involved in space activities for the purpose of supervision. This paragraph responds generally to the regulations of the OST. Paragraph 3, continuing, clarifies that it is necessary to create a new or assign an existing component authority the task of being in charge of authorizing/supervising private space affairs. Meanwhile, this paragraph recognizes the necessity of creating preconditions and procedures for granting, modifying, suspending and revoking authorizations. Furthermore, by considering the different kinds of space activities it specially mentions that specific procedures can be employed in licensing/authorizing activities. The conditions for authorization are specially interpreted by paragraph 4, but no specific criteria for conditions have been provided. However, the basic principles have been considered, namely, consistency with international obligations and reflecting the national security and foreign interests of States. Moreover, the paragraph stipulates that such conditions could also relate to the experience, expertise and technical qualifications of the applicant and could include safety and technical standards that are in line. The Space Debris Mitigation Guidelines of the COPUOS is mentioned in particular.

Paragraph 5 focuses on the appropriate procedures for ensuring the continuing supervision and monitoring of authorized space activities. Several measures of supervision, such as a system of on-site inspections or general reporting, are suggested. Paragraph 6 deals with the registration of objects launched into outer space. In addition to reflecting the requirements of the REG, more information is emphasized for the registration purpose, for example, the paragraph proposes that the state may also provide information

[192] With respect to the NatLeg Resolution, see: A/AC.105/C.2/2013/CRP.6s, Draft Model Law on National Space Legislation. In the following discussion of this paragraph, the provisions cited from the NatLeg Resolution will not be specially mentioned in the footnotes.

on any change in the main characteristics of space objects, in particular when they have become non-functional. Seeking methods of recourse against operators or owners of space objects is recommended in Paragraph 7. In order to ensure the appropriate coverage of damage claims, insurance requirements are also introduced. In the last paragraph, the continuing supervision of non-governmental space activities is particularly mentioned in the event of an ownership transfer. In brief, it is recommended that information should be provided in the case of a transfer by private entities of ownership/control of a space object in orbit. This requirement is especially meaningful against the background of space commercialization.

The elements proposed by the NatLeg Resolution on national legislation, which are worthy of consideration are very closely related and quite similar to the elements contained in the ILA Model Law. However, they rather constitute a summary and are more descriptive of the situation based on current State practice. However, the recommendations have outlined the basic content for national space legislation for the future, and more detailed regulations can be created in accordance with the different situations of relevant States.

C. Basic Content Analysis of National Space Legislation

In summarizing, there are six aspects of the basic content, which are common to the ILA Model Law and the NatLeg Resolution. They are: the scope of application and jurisdiction; authorization and the conditions for authorization; the continuing supervision and enforcement; the registration; the recourse and insurance and the transfer of space activity.

I. Scope of Application and Jurisdiction

The scope of application is the object targeted by national space legislation. Jurisdiction is the basis for national space legislation applicable to a specific space activity. The practice of States in defining the material scope of application of national space law is of considerable diversity. Closely related to the material scope, the meaning of the term ‘space activities’ plays a pivotal role. Some States provide a definition of “space activities” and demand the

authorization of all or part of the thereunder defined space activities. On the other hand, some States only enumerate or select some activities or even a single activity and request authorization rather than explicitly define the term 'space activity'. Among these States, the scope of application varies from very narrow to very broad. For example, the law of Norway only applies to launch activities.[193] The law of Germany applies to space data protection.[194] However, the law of Russia, not only explicitly defines the term "space activities" but also does so in such a particular and broad way, which includes a large number of activities.[195]

The NatLeg Resolution chose a rather straightforward solution and, instead of trying to formulate a definition of the term "space activities" or "activities in outer space", in paragraph 1, it simply enumerates a number of definitions taken from existing space legislation.[196] The result reflects the diversity of actual state practice in the scope of application of respective national space law. The non-exhaustive enumeration of national law's possible scopes of application does not in any way impose or limit any particular definition as to what "space activities" or "activities in outer space" could constitute under national law.[197] By contrast, the ILA Model Law chose to provide the definition "space activities" in Art. 2, together with other definitions like commercial space activities, space object, operator etc. The term "space activities" is defined as "the launch, operation, guidance, and re-entry of space objects into, in and from outer space and other activities essential for the launch, operation, guidance and re-entry of space objects into, in and from outer space". This definition of "space activities" is closely in

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[193] Art. 1 of the Act on Launching Objects from Norwegian Territory etc. into Outer Space states that: "Without permission from the Norwegian Ministry concerned, it is forbidden to launch any object into outer space from: a) [...] b) [...] and c) [...]."

[194] Part 1, Section 1 (1) of the German SatDSiG states that: "this Act applies to the operation of high-grade earth remote sensing systems a) [...] b) [...] and c) [...]."

[195] Art. 2 -The Concept of Space Activity, of the Law of the Russian Federation "About Space Activity" addresses: [...] others include any activity connected with operations to explore and use outer space, such as scientific space research, use of space technology for communications, manufacturing of materials and products in outer space, or preparation for launch or launch of space objects etc.

[196] Marboe, Irmgard, *Paragraph 1 - Recommendation: Scope of Application, of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, pp. 559-560.

[197] Ibid.

line with current international space law and state practice.[198]

With regard to national jurisdiction, territorial jurisdiction is exercised in all of the existing national space laws, while several laws restrict the scope of personal jurisdiction outside the territory of the States concerned.[199] However, the content of territorial jurisdiction differs. The concepts of territory, jurisdiction and "jurisdiction and control" are the options, which have been utilized to varying degrees.[200] It is also notable that the extraterritorial application of national space legislation is specially regulated in some States. For example, in the law of Norway, Norwegian territory also includes Svalbard, Jan Mayen and Norwegian external territories.[201]

Regarding personal jurisdiction, most national space laws apply their national jurisdiction to persons in and outside of the State's territory, but with a few clear exceptions and some less clear regulatory systems.[202] Certain practice regarding the restraint of national jurisdiction seems to avoid duplicative regulatory control for respecting the predominant nature of the territorial jurisdiction of other countries.[203]

The NatLeg Resolution recommends that "State should ascertain national jurisdiction over space activities carried out from territory under its jurisdiction and/or control; likewise, it should issue authorizations for and ensure supervision over space activities carried out elsewhere by its citizens and/or control, provided, however, that if another State is exercising jurisdiction with respect to such activities, the State should consider forbearing from duplicative requirements and avoid unnecessary burdens".[204] The purpose of this recommendation is to identify which national law should

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[198] Hobe, Stephan, *The ILA Law for National Space Legislation,* German Journal of Air and Space Law (1), 2013, p. 89.

[199] Aoki, Setsuko, *Practical Background of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p. 510.

[200] For specifics regarding national jurisdiction, please see ibid., at pp. 510-514.

[201] Art. 1 (a) of the Act on Launching Objects from Norwegian Territory etc. into Outer Space.

[202] Aoki, Setsuko, *Practical Background of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p. 512.

[203] Ibid.

[204] UNGA 68/74, Recommendations on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space, 11 December 2013.

apply to a particular space activity. It tries to delineate the jurisdiction of a State with respect to the jurisdiction of another State concerning the regulation of space activities. This is particularly important in relation to space activities in which actors of more than one State is involved.[205] In Art.1 of the ILA Model Law, a clear genuine link is required by the respective State, which enacts the national space law. This link is the nationality of the natural or the legal person involved in carrying out activities in a certain territory or on the nationally registered ships and aircraft.[206]

The scope and jurisdiction of national space legislation are not fixed but are evolving together with the new developments that respectively occur in space activities. For example, in 2013, the Belgian Space Law of 2005 was subjected to a proposal for an amendment because the Government wanted to explicitly exclude suborbital flights from the application of the law.[207] In the jurisdictional scheme of the Outer Space Act of the UK, a foreign government or nationals which carry out space activities in the territory of the UK is excluded from its application.[208] This scheme will be changed soon as the construction of spaceports, which will encourage foreign space actors to come to the UK, is now becoming promising.[209]

II. Authorization and Conditions for Authorization

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[205] Marboe, Irmgard, *Paragraph 1 - Recommendation: Scope of Application, of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p. 566.

[206] Hobe, Stephan, *The ILA Law for National Space Legislation,* German Journal of Air and Space Law (1), 2013, p. 88.

[207] Marboe, Irmgard, *Paragraph 1 - Recommendation: Scope of Application, of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p. 561.

[208] Section 1, para. 2 of the United Kingdom Outer Space Act of 1986. For further specifics see: Aoki, Setsuko, *Practical Background of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne 2015, p. 513, see also: Cheng, Bin, *Nationality for Spacecraft?* in: Masson-Zwaan, Tanja et. eds., Air and Space Law: De Lege Ferenda- Essays in Honour of Henri A. Wassenbergh, Martinus Nijhoff, Leiden, 1992, p. 214.

[209] On the 21 February 2017, the Government published a Draft Spaceflight Bill to "provide for the creation of a regulatory framework to enable commercial spaceflight activities to be carried out from spaceports in the United Kingdom". See: Danby, Grahame, *Outer Space,* Briefing Paper, Number CBP 7464, 10 March 2017, p. 3. The text of the "Draft Spaceflight Bill" is available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/592928/draft-space-flight-bill-web.pdf.

Authorization is the fundamental obligation under Art. VI of the Outer Space Treaty, namely that all non-governmental space activities need to be authorized by the State. As one of the most important purposes of national space legislation, each national law shall contain the provisions to compel its non-governmental entity to act in accordance with international obligations, especially those reflected in the UN space treaties.[210]

In the context of the existing national regulatory framework for space, most States specify the competent national authority or authorities, which grant authorization and provide for the conditions and procedures for granting, modifying suspending or revoking such authorizations.[211] The same content is recommended by para. 3 of the NatLeg Resolution for those States which have not yet enacted national space legislation. The recommendation and Art. 3 of the ILA Model Law do not define which agencies or authorities would provide the best solution. However, the recommendation highlights that the authorities should be set out clearly and defined precisely within the regulatory framework in order to both benefit the government itself and the space actors who want to be able to easily identify the appropriate authority to turn to. It is thus another aspect which helps to fulfill "the need for consistency and predictability with regard to the authorization and supervision of space activities," as emphasized in the Preamble.[212]

Most national laws explicitly provide for the concrete conditions to obtain an authorization, as the conditions for authorization are the most important tool for the State to regulate space activities in accordance with its interests and international obligations. Based on the national practice, recommended by the NatLeg Resolution and settled in the ILA Model Law, the basic conditions of authorization can be summarized as being the following aspects: (a) the qualified financial capacity of the applicant; (b)

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[210] Aoki, Setsuko, *Practical Background of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p. 518.

[211] Details have been completely expounded, see ibid., at pp.514-517.

[212] Marboe, Irmgard, *Paragraph 3 - Recommendation: Authorization/Competent National Authority, of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p.579.

reliable technical knowledge of the applicant; (c) protection of the environment and mitigation of space debris; (d) meeting the demands of national security and foreign policy interests; (e) compliance with international obligations.

1. Qualified Financial Capacity of the Applicant

The affirmation of the financial capacity of the applicant in the process of applying for authorizations for space activities is required by nearly every State which has adopted related legislation. The requirement of proving financial capacity is a measure to ensure that the applicant is financially qualified to act as a participant in space activities.

In order to prove financial capacity, the applicant is required to submit the relevant documentation. Different national regulations have several practices in this regard. For example, the regulations of the Netherlands require the applicant to submit documents which consist of: a) a projected profit and loss account with explanatory notes; b) a projected balance sheet with explanatory notes; c) a cash-flow forecast; and d) a financial risk analysis, indicating what financial control measures have been taken to ensure the continuity of the space activities, to prove its financial capacity.[213] Compared to the law of the Netherlands, which focuses much more on the financial situation of the specific project, the Brazilian law emphasizes the financial capacity of the applicant itself. Accordingly, in order to prove financial capacity, the applicant has to submit *inter alia* the following documents: a) an asset balance sheet and accounting statements for the last corporate fiscal year; b) a negative certificate of bankruptcy or the termination of a business; and c) the purchase of third party insurance is considered to be an item meeting the demands of proving financial capacity under Brazilian law.[214]

The requirement by national regulations of proving the financial capacity

[213] See: Art.2 (2) b of the "Order of the Minister of Economic Affairs dated February 2008, no. WJZ 7119929, Containing Rules Governing License Application for the Performance of Space Activities and the Registration of Space Objects".

[214] Art. 9 of the Regulation on Procedures and on Definition of Necessary Requirements for the Request, Evaluation, and Issuance, Follow-up and Supervision of Licenses for Carrying out Launching Space Activities on Brazilian Territory.

of the applicant of the space activities license was created to ensure the relevant program can be successfully, reliably, safely and continuously completed. Due to the differences in legal systems, management forms, and company conditions across different States, the documentation requirement varies. It needs to be mentioned that insurance requirements are also included in many national regulations as a part demonstration of the applicant's financial capacity or as one of the authorization conditions, details thereon will be discussed in the insurance part of the present research.

2. Reliable Technical Knowledge of the Applicant

The requirement for the applicant to have reliable technical knowledge is another basic requirement of the conditions pertaining to national authorization. Similar to the requirement of financial capacity, it also intends to ensure the reliability of the applicant with regard to the smooth completion of the relevant activities in the space sector. At the same time, the requirement of reliable technical knowledge will potentially contribute to reducing the probability of damage caused by the relevant space activities.

Accordingly, for the purpose of proving the reliability of the technical knowledge of the applicant, related documents are necessary. For example, under the law of the Netherlands, the documents which should be provided for the purpose of proving technical knowledge include: a) an account of the applicant's knowledge and experience with regard to the performance of space activities; and b) documentary evidence demonstrating that this knowledge or experience will be safeguarded during the performance of the space activities.[215] Similar requirements can also be found under Brazilian law. Moreover, Brazilian law focuses not only on the technical knowledge of the applicant with regard to the specific program applied for but also with regard to the situation of the applicant in general.[216]

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[215] See: Art.2 (2) of the "Order of the Minister of Economic Affairs dated February 2008, no. WJZ 7119929, Containing Rules Governing License Application for the Performance of Space Activities and the Registration of Space Objects".

[216] For instance, the Brazilian law requires the applicant to submit the "registration or inscription in the appropriate trade association." see: Art. 8-I of the Regulation on Procedures and on Definition of Necessary Requirements for the Request, Evaluation and Issuance, Follow-up and Supervision of Licenses for Carrying out Launching Space Activities on Brazilian Territory.

Special experts should be designated especially in examining the applicant's technical qualifications. The regulation under Belgian law is an example which stipulates that: "the minister may call for a reasoned opinion, to be provided by experts to be designated by him for that purpose, on the basis of legal, technical and economic criteria, concerning in particular the reliability, know-how and experience of the operator, the reliability of the manufacture in the areas concerned and their capacity to comply with the rules applying to the activities carried out, as well as the operator's solvency and the legal and financial guarantees that he provides".[217]

In sum, qualified financial capacity and technical knowledge are two foremost conditions for applying for the authorization of space activities. The sufficient and compelling preparation of documents is essential before the application, from the perspective of the applicant. Furthermore, with respect to the competent authority or authorities that are obliged to authorize the relevant activities, there should be meticulous criteria for determination, with the assistance of specific experts.

3. Protection of the Environment and the Mitigation of Space Debris

The avoidance of the potential environmental contamination of space activities is an obligation regulated by the 1967 Outer Space Treaty.[218] The increasing quantity of space debris[219] has caused growing concern in the international community. Hence, the mitigation of space debris has already become the most urgent and important part of outer space environment protection. Even though the mitigation of space debris is not yet accepted as a mandatory obligation in space activities, the universal acceptance of the directives contained in the "Space Debris Mitigation Guidelines" has gradually made the 'mitigation of space debris' in space activities customary international law. The ILA Model Law and the NatLeg Resolution both take

[217] Art. 7 (6) of the Law of 17 September 2005 on the Activities of Launching, Flight Operation or Guidance of Space Objects, consolidated text as reviewed by the Law of 1 December 2013 (B.O.J. Of 15 January 2014).

[218] Art. IX of the 1967 Outer Space Treaty.

[219] Concerning the amount of space debris, relevant statistics can be found in Space Surveillance and Tracking, available at: http://www.esa.int/Our_Activities/Operations/Space_Situational_Awareness/Space_Surveillance_and_Tracking_-_SST_Segment concerning serious harm caused by space debris.

environment protection and space debris mitigation as conditions for authorization.

Art. 4 of the ILA Model Law provides that mitigating space debris is an important condition for applying for an authorization for space activities. Moreover, Art. 8 explicitly regulates the mitigation of space debris and the concrete content of the obligation is codified by Para. 2, which includes the obligation to limit debris released during normal operations, to minimize the potential for on-orbit break-ups, to prepare for post mission disposal and to prevent on-orbit collisions in accordance with international space debris mitigation standards.[220] In Para. 4 of the NatLeg Resolution, an explicit reference to the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space in the context of "safety and technical standards" is provided, which has been seen as a remarkable achievement.[221]

In order to meet the demand of mitigating space debris, the entities applying to conduct space activities in different States have to take appropriate measures in accordance with the corresponding national space legislation. For example, Austrian law requires the applicants to make provision for the mitigation of space debris in accordance with standard the state of the art and in due consideration of the internationally recognized guidelines for the mitigation of space objects.[222] In addition, the same provision also requires the operator to particularly take measures limiting debris released during normal operations.[223] To obtain authorization in Belgium, the applicant has to attach information concerning a study of the impact on the environment.[224] This study aims to assess the potential impact of launching or operating a space object on the environment on earth or in

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[220] Art. 8-Mitigation of Space Debris, of the ILA Model Law.

[221] Marboe, Irmgard, *Paragraph 4 - Recommendation: Conditions for Authorization, of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p. 585.

[222] Art. 5-Mitigation of Space Debris, of the Austrian Federal Law on the Authorization of Space Activities and the Establishment of a National Registry, adopted by the National Council on 6 December 2011, entered into force on 28 December 2011.

[223] Ibid.

[224] Art. 7-2 (5) of the Law of 17 September 2005 on the Activities of Launching, Flight Operation or Guidance of Space Objects, consolidated text as reviewed by the Law of 1 December 2013 (B.O.J. Of 15 January 2014).

outer space.[225] In the period of applying for an authorization, the study of space debris with regard to the space program can be titled as an "initial study", after obtaining authorization, and following completion of the launching activity, an intermediate study shall be carried out at the request of the minister. Furthermore, this study shall access the real consequences of the activities in question on the environment on earth or in outer space,[226] thereafter, when the space object returns to the earth's atmosphere, a final study may be required by the Minister.[227]

In practice, some States introduce secondary technical regulations to cover the space debris problem. For example, France issued a "Decree on Technical Regulation pursuant to the French Space Operation Act," which contains the technical requirements that any operator must comply with. The Technical Regulation is composed of a first part dedicated to launch systems and a second part dedicated to orbital systems. Both parts contain provisions related to the mitigation of space debris.

By introducing the examples of national space legislation above, one can see that, firstly, to protect the environment and mitigate space debris is a very important condition for applying for authorization for space activities. Furthermore, the protection includes the aspects of the preservation of the air, the earth, as well as the space environment. Mitigation of space debris is one major concern in space environmental protection. Secondly, the mitigation of space debris should not be required during the application for authorization but should also be a continuous requirement in the whole operation/returning process of the related space programs.

4. Meeting the Demands of National Security/ Foreign Policy Interests

The national security and foreign policy interests of States may be reflected in the conditions for authorization recommended in Para. 4 of the NatLeg Resolution. Art. 4 of the ILA Model Law pays attention to this too. States are encouraged to think about their national security and foreign policy interests

[225] Ibid.
[226] Ibid.
[227] Ibid.

when they authorize national space activities reflecting the legitimate interests of States, which need to be respected and safeguarded.[228]

The measures under Belgian law are necessary to mention as an example. The following information is required to be disclosed by the applicant to obtain authorization, for instance, the precise identification of the operator, a presentation of its past, current and future activities [...]; a precise description of the activities for which the authorization is sought; the precise identification of the space object or the series of space objects for which the authorization is sought; the identification of the manufacturer(s) of the space object; the precise identification of the persons on whose behalf the activities will be carried out; and the most precise as possible identification of the persons who will collaborate in the activities etc.[229] Regulations under Belgian law can basically help the qualified administration to confirm the identification of the relevant participants of the space programs and the basic functions and purposes of the space activities, which will positively ensure the protection of national security. Moreover, the Belgian provision especially mentions the identification of the persons that will collaborate the space activities; this is rather significant against the background of the development of private space cooperation.

With respect to the requirement of meeting foreign policy interests, national space laws can be regulated based on specific foreign policies. Moreover, the emphasis is placed on national security considerations and compliance with international obligations rather than on the strict technical and financial reliability often underlined in launch/return and the operation of the space object concerning the act of remote sensing activity.[230] For example, the Canadian Remote Sensing Space Systems Act states that a decision on

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[228] Marboe, Irmgard, *Paragraph 4 - Recommendation: Conditions for Authorization, of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p.584.

[229] Art. 7-2 of the 17 September 2005 on the Activities of Launching, Flight Operation or Guidance of Space Objects, consolidated text as reviewed by the Law of 1 December 2013 (B.O.J. Of 15 January 2014).

[230] Aoki, Setsuko, *Practical Background of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p.520.

issuing a license has to have regard to national security, the defense of Canada, the safety of Canadian Forces, Canada's conduct in international relations etc.[231]

5. Compliance with International Obligations

Para. 4 of the NatLeg Resolution reminds States that they should implement their obligations under international law by formulating conditions that are consistent with international obligations, in particular under the UN space treaties together with other relevant instruments. The ILA Model Law also emphasizes that the requirement regarding international obligations should not be breached.

In the field of space activity, the most important international regulations can be basically grouped into the following three types:

The first category is international space treaties: for instance, the 1967 Outer Space Treaty, the 1968 Rescue Agreement, the 1972 Liability Convention, the 1976 Registration Convention, and the 1979 Moon Agreement. These treaties outline the basical legal framework of activities in outer space. Apart from the Moon agreement, the other four treaties have been generally ratified by the majority of States.[232]

The second category consists of resolutions which are adopted by the United Nations General Assembly (UNGA). UNGA resolutions are not legally binding. However, they have a significant influence on relevant fields of space activities. From the 1980s to date, the main UNGA resolutions which are relevant to space affairs include for example: the 1982 Principles of International Direct Television Broadcasting;[233] the 1986 Principles Relating to Remote Sensing of the Earth from Outer Space;[234] the 1992 Principles

[231] Sec.8 para. 1, of the Remote Sensing Space System Act (Canada 5), April 2007, as amended.

[232] So far there are 105 member States of the Outer Space Treaty; the Rescue Agreement has been ratified by 95 States; there are 94 member States of the Liability Convention, and there are 63 member States of the Registration Convention. Only 17 States have signed and ratified the Moon Agreement, and the most important space-faring nations are all not member States thereof. See: Status of International Agreements relating to activities in outer space as at 1 January 2017, available at: http://www.unoosa.org/documents/pdf/spacelaw/treatystatus/AC105_C2_2016CRP03E.pdf.

[233] UNGA Res. 37/92, Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting, 10 December 1982.

[234] UNGA Res. 41/65, Principles Relating to Remote Sensing of the Earth from Outer Space, 3 December 1986.

Relevant to the Use of Nuclear Power Sources in Outer Space;[235] and the 1996 Declaration of International Cooperation etc.[236] In addition to establishing principles in the relevant fields of space affairs, UNGA resolutions have also been adopted to interpret the international space treaties, for example, the 2004 Resolution on the Application of the Concept of the 'Launching State';[237] and the 2007 Resolution on the Recommendation on Enhancing the Practice of States and International Intergovernmental Organizations in Registering Space Objects etc.[238]

The third category consists of obligations stemming from other International Treaties. This results from Art. VIII of the OST, which requires that space activities should be carried out "in accordance with international law". Para. 4 of the NatLeg Resolution also reminds States that those other obligations should also be implemented and thus included in the conditions for authorization. Particularly, the ILA Model Law explicitly lists as one of the authorization conditions that 'the operator has complied with ITU Regulations with regard to the frequency allocations and orbital positions.'

In order to ensure authorizations are in accordance with the requirements of the ITU regulations, domestic laws usually accept the legal arrangement of the ITU. For example, Austrian law requires the applicant to fulfill the requirements of the ITU concerning orbital positions and frequency assignments etc.[239] As the ITU has already established a comprehensive legal framework, there is no need for national space legislation to include provisions dealing with the frequency/orbital positions issues; the ITU regulations can be applied.

Concerning compliance with international obligations, it is necessary to

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[235] UNGA Res. 47/68, Principles Relevant to the Use of Nuclear Power Sources in Outer Space, 14 December 1992.

[236] UNGA Res. 51/122, 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, 13 December 1996.

[237] UNGA Res. 59/115, Application of the Concept of the "Launching State", 10 December 2004.

[238] UNGA Res. 62/101, The 2007 Recommendations on Enhancing the Practice of States and International Intergovernmental Organization in Registering Space Objects, 17 December 2007.

[239] Art. 4-Conditions for Authorization, of the Austrian Federal Law on the Authorization of Space Activities and the Establishment of a National Registry, adopted by the National Council on 6 December 2011, entered into force on 28 December 2011.

note that, in recent years, some national laws have strived to interpret the unclear understanding of international obligations. For example, the United States Space Act of 2015 allows U.S. citizens to engage in the commercial exploration and exploitation of space resources,[240] which is broadly regarded as a violation of the rule of the non-appropriation of outer space/celestial bodies regulated in the OST. Soon after, this practice was followed by further national legislation.[241]

III. Registration

The preliminary consideration for national legislation derived from implementing international legal rules when the obligation of registration has grown increasingly serious and demanding.[242] The international regime related to registration is primarily regulated by the UNGA Resolution 1721 (XVI) of 1961,[243] the OST, the REG and the RegPract Resolution of 2007.[244] Fundamentally, Art. II of the REG requires the establishment of a national registry for space objects and the State determines the content of each registry and the conditions under which it is maintained. In terms of the registration of private space objects, private companies are not entitled to directly register their space objects with the UN Secretary-General. In order to do so, they have to rely upon their respective State(s).[245] Accordingly, non-governmental entities must register their space object(s) in the relevant State's

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[240] Orphanides, K. G, *American companies could soon mine asteroids for profit,* online at: http://www.wired.co.uk/news/archive/2015-11/12/how-to-mine-asteroids-for-fun-and-profit.

[241] For example, the legal measures created by Luxembourg have recently reflected the basic consideration of the American 2015 Space Act. For specifics regarding the domestic law of Luxembourg, see: Luxembourg takes first steps to 'asteroid mining' law, available at: http://phys.org/news/2016-06-luxembourg-asteroid-law.html, see also: De Selding, Peter B., *Luxembourg invests to become the 'Silicon Valley of space resource mining',* available at: http://spacenews.com/luxembourg-invests-to-become-the-silicon-valley-of-space-resource-mining/, the text of the "Draft Law on the Exploration and Use of Space Resource" of Luxembourg is available at: http://www.spaceresources.public.lu/ content/dam/spaceresources/news/Translation%20Of%20The%20Draft%20Law.pdf.

[242] Wu, Xiaodan, *China's space law: Rushing to the finish line of its marathon,* Space Policy (46) 2018, p. 40.

[243] UNGA Res. 1721 (XVI), International Co-operation in the Peaceful Uses of Outer Space, 20 December 1961.

[244] UNGA Res. 62/101, The 2007 Resolution on Recommendations on Enhancing the Practice of States and International Intergovernmental Organizations in Registering Space Objects, 17 December 2007.

[245] Jakhu, Ram S. /Jasani, Bhupendra/ McDowell, Jonathan C., *Critical Issues Related to Registration of Space Objects and Transparency of Space Activities*, Acta Astronautica (143) 2018, p. 408.

national registry. Thus, a regulation, which at least contains the procedure, the administration of registration, registration information, etc., must be established. Besides the basic regulations on the national registry, Art. 10 para. 3 of the ILA Model Law especially describes the necessity of coordinating with the other State(s) if there are two or more launching States to determine which could qualify as a launching State.[246] This is in line with Art. II para. 2 of the REG and Para. 3 lit. (b) of the RegPract Resolution.

The recommendation of the NatLeg Resolution addresses the "operators or owners of space objects"[247] for which the State is considered to be the launching State, or the State responsible for national activities, which should be requested to submit information to the authority.[248] This is an interesting novelty because neither of the UN space treaties use this expression,[249] which is based on the practice of national space laws/decrees/regulations. For example, Austrian law requires the operator to submit the necessary information to the appropriate minister for registering the space objects launched,[250] similar rules were settled under Belgian Law[251]. Moreover, as regulated by the law of the Netherlands, the license-holder is required to furnish the necessary information for the registration of a space object.[252] As regulated in the Chinese 2001 "Measures for the Administration of Registration of Space Objects ", the body that is responsible for the

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[246] Several States have such a kind of regulations, for example, the Law of Australia, Austria, Belgium, France, Russia, Ukraine etc.

[247] The owner and/or operator of the space object appears first in the RegPract Resolution of 2007, which addresses such operators or owners only indirectly. See: Marboe, Irmgard, *Paragraph 6 - Recommendation: National Registry/Information by Operators or Owners, of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p. 591.

[248] Paragraph 6 of the NatLeg Resolution.

[249] Marboe, Irmgard, *Paragraph 6 - Recommendation: National Registry/Information by Operators or Owners, of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne 2015, p. 591.

[250] Art. 10 (2) of the Austrian Federal Law on the Authorization of Space Activities and the Establishment of a National Space Registry (Austrian Outer Space Act, adopted by the National Council on 6 December 2011, entered into force on 28 December 2011).

[251] Art. 14 of the of the Law of 17 September 2005 on the Activities of Launching, Flight Operation or Guidance of Space Objects, consolidated text as reviewed by the Law of 1 December 2013 (B.O.J. Of 15 January 2014).

[252] Art. 4 (1) of the Decree of 13 November 2007, Containing Rules with regard to a Registry of Information Concerning Space Objects.

registration is the owner/main owner (when more than one exists) of the space objects,[253] and when the owner of the space objects is foreign, the registration should be completed by the companies which provide commercial launching services.[254]

Information which should be furnished as regulated by the REG is also overlapped by the ILA Model Law and the majority of national laws/decrees or regulations,[255] which provide for registration, including the following aspects: (1) the name of the launching State or States; (2) an appropriate designator of the space object or its registration number; (3) the date and territory or location of the launch; (4) basic orbital parameters, including the nodal period, inclination, apogee, perigee; and (5) the general function of the space object.[256] Furthermore, additional information concerning a space object must be provided, and in the circumstance of a change of situation to the space objects, for example, when the space objects are no longer in the earth's orbit, the appropriate State is required to inform the Secretary-General to the greatest extent feasible and as soon as is practicable.[257] In addition, the NatLeg Resolution provides the reference that when a space object becomes non-functional, information is requested as to such a change. This reference helps facilitate the better exchange of information on space debris, which is so far not common practice.[258]

Under some States' national laws, especially those which have been enacted after the start of the agenda item on the "practice of States and international organizations in registering space objects" (2004-2007) in the Legal Subcommittee of UNCOPUOUS, additional information is also required setting out new elements to be provided to a competent authority.[259]

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[253] Art. 7 of the Measures for the Administration of Registration of Space Objects (2001).

[254] Art. 8 ibid.

[255] For example, Belgian law stipulates that: "the information contained in the Register is that referred to in article IV of the Convention on Registration of Space Objects.

[256] Art. IV (1) of the Registration Convention.

[257] Art. IV (2)-(3) of the Registration Convention.

[258] Marboe, Irmgard, *Paragraph 6 - Recommendation: National Registry/Information by Operators or Owners, of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p. 592.

[259] Aoki, Setsuko, *Practical Background of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns,

For example, under the law of the Netherlands, in addition to the expected/actual launch date, the decommissioning date is also required to be submitted as registered information.[260] Moreover, the information of the license-holder, as well as other information pertaining to the space object, are regulated as being necessary to register a space object.[261]

IV. **Continuing Supervision and Enforcement**

Continuing supervision of the non-governmental space activities is an obligation of States as set forth by the UN space treaties. This obligation aims to ensure that the conditions set out for authorization are not only observed before the activity has begun, but also for the whole duration of the activity.[262] However, the way in which the respective procedures of supervision and the specific methods should be organized is not provided by the UN space treaties, States are free to determine the concrete content.

For continuous supervision, recommendations are provided both by the ILA Model and the NatLeg Resolution, which can be regarded as a summary of what has been presented by State practice. The ILA Model Law advises that details of the supervision shall be laid down in an implementing decree/regulation and authorization shall be withdrawn, suspended or amended if the conditions of the authorization are no longer complied with.[263] A system of on-site inspections or a more general reporting requirement; enforcement mechanisms including administrative measures, such as the suspension or revocation of the authorization, and/or penalties are advocated by the NatLeg Resolution.[264]

Although the range of possible means of supervision and the monitoring of space activities is very broad, it may start from a mere reporting

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Cologne, 2015, p. 527.

[260] Art. 3 (d), (e) of of Decree of 13 November 2007, Containing Rules with regard to a Registry of Information Concerning Space Objects.

[261] Art. 3 (g) ibid.

[262] Gerhard, Michael, *Article VI of the Outer Space Treaty,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume I, Carl Heymanns, Cologne, 2009, p. 119.

[263] Art. 5-Supervision and Art. 6-Withdrawal, Suspension or Amendment of Authorization, of the ILA Model Law.

[264] Paragraph 5- Recommendation: Continuing Supervision/Enforcement, of the NatLeg Resolution.

requirement to a system of inspections- with or without an announcement of visitation- and can include administrative sanctions, such as the suspension or revocation of the authorization,[265] common elements can be identified in existing national laws in their provisions concerning continuing supervision.[266] Those common elements can be classified as:

a) information and notification, for example, in the Space Activities Act of the Netherlands, the license-holder shall furnish information on registration to the Minister and shall notify the Minister of any changes to the information as soon as possible.[267]

b) right of access, in Art. 10 of the Belgian Act, experts designated by the Minister shall have access to all documents in the possession of the operator relating to the activities covered by the authorization, to updated information and data resulting from the activities, as well as to the premises allocated, directly or indirectly, to the activities. In the event that the operator refuses to grant access to the experts, the Minister may suspend or withdraw the authorization.[268]

c) to direct, modify, suspend and terminate the activity by the supervising authorities. Normally, non-compliance with the conditions of authorization, the contravention of public health, State interests and security always lead to such decisions by the supervising authorities.

d) sanctions, sanction clauses are found in the majority of national legislation, which often provide for civil penalties consisting of imprisonment and fines.[269] Artt. 9-11 of the French Space Operations Act are very clear examples.[270]

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[265] Marboe, Irmgard, *Paragraph 5 - Recommendation: Continuing Supervision/Enforcement, of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p. 587.

[266] Aoki, Setsuko, Practical Background of the NatLeg Resolution, in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, pp. 521-522.

[267] Artt.4-5 of the Space Activities Act (The Netherlands), 24 January 2007.

[268] Art. 10 of the Act relating to Activities of Launching, Flight Operations or Guidance of Space Objects (Belgium), 17 September 2005.

[269] Aoki, Setsuko, Practical Background of the NatLeg Resolution, in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p. 523.

[270] For details see: Artt. 9-11, of the Act relating to Space Operations (France), 3 June 2008.

V. Recourse and Insurance

The majority of the existing national legislation provides that the State could seek recourse from the operator or owner of space objects if the State had paid compensation to a third party under the liability regime set up by the UN space treaties or other relevant international law. Particularly in the light of the progress of the privatization and commercialization of space activities, with more and more private space actors being active in the space field, a national indemnification system must meet the challenge of better balancing the interests of private space actors and the State, and at the same time not impede the enthusiasm of private parties.

The NatLeg Resolution recommends that States consider ways of seeking recourse from the operators or owners of space objects and in order to ensure appropriate coverage for damage claims, States could introduce insurance requirements and an indemnification procedure, as appropriate.[271] The same content is also included in Art. 11 of the ILA Model Law, furthermore, a regime for a "limited" recourse for States with regard to the operator is foreseen.[272] The general liability regime set out in Art. VII of the Outer Space Treaty and elaborated upon in the Liability Convention constitutes a liability regime which has no ceiling and which is not limited in time or territory represents an incentive for States to take appropriate steps to minimize the risk of damage and to avoid this liability becoming engaged.[273] However, the unlimited liability placed on private space actors is very difficult for them to manage in terms of financing, especially when they turn to the insurance company, which places them at a significant disadvantage as is commonly known, it is not possible to obtain insurance for an unlimited amount of

[271] Paragraph 7-Recommendation: Recourse against Operators or Owners/Insurance, of the NatLeg Resolution.

[272] Hobe, Stephan/Chen, Kuan-Wei, *Legal Status of Outer Space and Celestial Bodies,* in: Jakhu, Ram/Dempsey, Paul (eds.), Routledge Handbook of Space Law, Routledge Taylor & Francis Group, London, New York, 2017, p. 41.

[273] Marboe, Irmgard, *Paragraph 7-Recommendation: Recourse against Operators or Owners/Insurance, of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p. 595.

damage.[274] Therefore, limited recourse is opted for by the ILA Model Law based on mirroring certain practice of existing national space legislation.

The insurance requirement is commonly accepted by the existing national space legislation. National laws often specify that a licensee shall either obtain an insurance or demonstrate their fulfillment of the financial requirement, and in some cases, obtaining insurance is one of the authorization conditions. It has been seen as a crucial issue related to the authorization of private activities in space due to the fact that any space activity entails huge financial risks, which must be taken into account. On the one hand, the operator has to insure himself/herself for liabilities, and on the other hand, this gives more ground to States to effectively exercise their right of recourse. [275] Furthermore, when commercial space cooperation is developed, and a program such as joint launch is established, the purchasing of insurance would also constitute a guarantee for the participants of the project to avoid extra liabilities in case of an accident.[276]

With respect to the amount of insurance for the purpose of applying for authorization, there are different practices in national space regulations. For example, Austrian law regulates that: "in order to cover liability for damages caused to persons and property, the operator is under the obligation to take out insurance covering a minimum amount of 60 million EUR."[277] Moreover, under South Korean Law, the maximum amount of insurance for a Korean project is limited to 200 million US dollars.[278] In India, the amount of third party liability insurance for private companies that intend to be involved in space activities is normally 100 million US dollars.[279]

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[274] Ibid., at p. 596.

[275] Hobe, Stephan, *The ILA Law for National Space Legislation,* German Journal of Air and Space Law (1) 2013, p. 94.

[276] Nie, Mingyan, *Legal Framework and Basis for the Establishment of Space Cooperation in Asia,* Lit Verlag, Muenster, p. 103.

[277] Art. 4-Conditions for Authorization of the Austrian Federal Law on the Authorization of Space Activities and the Establishment of a National Space Registry (Austrian Outer Space Act, adopted by the National Council on 6 December 2011, entered into force on 28 December 2011).

[278] Art. 5 of the South Korean 2007 Space Liability Act.

[279] Sagar, David, *Compulsory Insurance: Basic Features of National Insurance Regulations,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Project 2001 Plus: Global and European Challenges for Air and Space Law at the Edge of the 21st Century-Towards a Harmonized Approach for National Space Legislation in Europe, Proceedings of the Workshop, 29/30 January 2004, Berlin, p. 100.

As introduced above, the compulsory amount required by Austrian law aims to cover the liability for damages caused to persons and property, and it is necessary to note the fact that, in the context of several national legislative practices, compulsory insurance, which is a precondition for authorizing space activities, also includes other aspects, for example, damage to the life and health of the cosmonauts and the personnel on the ground and to other objects of space infrastructure.[280] In other words, in addition to the requirement of third party insurance, other kinds of insurance can be required for authorizing space activities under national law, for example first party insurance.[281]

It is often provided that in the case of indemnification, a space operator is liable for damage caused by its space object up to the value of the sum insured. For example, in France, this is up to the amount set out in the conditions mentioned in the Finance Act, which is 60 million EUR.[282] However, it is a matter of fact that there is no uniform criterion with regard to the amount of insurance. Moreover, there has been no special consideration of the insurance amount based on the different scale of space programs covered by many national regulations. Under such circumstances, some harmonization of the required amount of insurance should be strived towards because otherwise there could be a danger of license shopping.[283]

The details of the content and conditions of insurance shall be laid down in an implementing decree/regulation,[284] which is also provided by the ILA Model Law based on the practice of existing national legislation.

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[280] Section V, Art. 25 of the Law of the Russian Federation "about Space Activity", Decree No. 5663-1 of the Russian House of Soviets.

[281] For example, in India. See: Norms, Guidelines and Procedures for Satellite Communications Announced, Press Release, 08, May 2000, available at: http://www.isro.gov.in/update/08-may-2000/norms-guidelines-and-procedures-satellite-communications-announced, last accessed 23 February 2016. See also: Sagar, David, *Compulsory Insurance: Basic Features of National Insurance Regulations,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Project 2001 Plus: Global and European Challenges for Air and Space Law at the Edge of the 21st Century-Towards a Harmonized Approach for National Space Legislation in Europe, Proceedings of the Workshop, 29/30 January 2004, Berlin, p. 110.

[282] Artt. 14-17, of the Act relating to Space Operations (France), French Law No. 2008-518 of 3 June 2008.

[283] Hobe, Stephan, *The ILA Law for National Space Legislation,* German Journal of Air and Space Law (1) 2013, p. 94.

[284] Art. 12 (4) of the ILA Model law.

VI. In-orbit Transfer of a Space Object

The eighth recommendation of the NatLeg Resolution focuses on the transfer of space object in orbit. States are recommended to continue supervising the space object, which relates to the event of the transfer of ownership or control. States may provide authorization requirements or request the furnishing of information on the change in the status of the operation of a space object in orbit. Art. 9 of the ILA Model Law explicitly regulates that the transfer of a space activity to another operator is subject to prior authorization. In-orbit transfer of ownership or transfer and control of a space object are also included in this article.[285]

In-orbit transfer of the ownership or control of a space object is certainly a noted new practice since approximately the late 1990s,[286] the issue is closely linked to the jurisdiction of the States concerned. This was particularly relevant for States when non-governmental actors were involved.[287]

A discrepancy exists between the factual and the legal possibility to exercise jurisdiction and control over a space object in the case of a transfer in orbit. Art. VIII of the Outer Space Treaty assigns "jurisdiction and control" of a space object to the State of registry, the treaty does not provide for any change in this assignment of jurisdiction and control but contemplates that it will perpetually remain with the original state of registry.[288] Art. I of the Registration Convention provides, however, that only a "launching State" can be a State of Registry.[289] Although it is appropriate for the launching State to have jurisdiction and control over a space object that it has put into orbit and is operating, it no longer makes sense for the original State of registry to retain

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[285] Hobe, Stephan, *The ILA Law for National Space Legislation,* German Journal of Air and Space Law (1) 2013, p. 91.

[286] Aoki, Setsuko, *Practical Background of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne 2015, p. 534.

[287] Marboe, Irmgard, *Paragraph 6 - Recommendation: National Registry/ Information by Operators or Owners, of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p.588.

[288] Sundahl, Mark J., *Legal Status of Spacecraft,* in: Jakhu, Ram/Dempsey, Paul, (eds.), Routledge Handbook of Space Law, Routledge Taylor& Francis Group, London, New York, 2017, p. 45.

[289] Chatzipanagiotis, Michael, *Registration of Space Objects and Transfer of Ownership in Orbit,* German Journal of Air and Space Law (2) 2007, p. 230.

jurisdiction and control once this space object has been transferred to another State.[290] This paradox is connected not only with the fact that at the time of the drafting of the Space Conventions the only actors conducting space activities were States, but also with the fact that at that time only a limited number of them had the possibility to engage in such activities.[291] As discussed in Chapter I, with the privatization and commercialization of space activities, the number of space actors has dramatically increased. The transfer of ownership of space objects in orbit has become quite common in the modern practice of the space industry.

As mentioned above, the international space conventions do not preclude any State from purchasing and owning a space object which it did not launch. They create, however, inconsistencies between the actual status and the typical legal status of a space object and the consequences arising therefrom. As this situation is not satisfactory, a variety of solutions will be proposed:[292] for example, the amendment of the Space Treaties,[293] the official acceptance of registration by a non-original launching State[294] etc. Among these solutions, regulations in national legislation to deal with the legal problems of a transfer in orbit were proposed. As the acquiring party will, in most cases, be a private company, it will need authorization. Such authorization could be passed over by the transferring party.[295]

Some national laws adopted in the 21st century explicitly provide for the authorization requirement with respect to the transfer of control of a space object.[296] For example, Art. 3 of the 2008 French Space Operation Act regulates that:

a) transferring the control of a space object which has been authorized

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[290] Sundahl, Mark J., *Legal Status of Spacecraft,* in: Jakhu, Ram/Dempsey, Paul (eds.), Routledge Handbook of Space Law, Routledge Taylor& Francis Group, London, New York, 2017, p. 45.
[291] Ibid.
[292] Chatzipanagiotis, Michael, *Registration of Space Objects and Transfer of Ownership in Orbit,* German Journal of Air and Space Law (2) 2007, p. 230.
[293] Ibid.
[294] Ibid.
[295] Ibid.
[296] Aoki, Setsuko, *Practical Background of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p. 534.

under this law to a third party is subject to the prior authorization of the administrative authority. A third party could be any party regardless of nationality, which means the transferee can be French national or foreign.

b) any French operator who intends to control a space object, the launch or control of which has not been authorized under this law must obtain prior authorization, granted for that purpose by the administrative authority. This applies to the case in which a French national is the transferee and the transfer is from a foreign national/country.

Although, in most cases, the registration of a space object's in-orbit transfer is not shown on the UN registry straight away. A large number of such transfers have still not yet been registered. Examples on the United Nations website nonetheless show such circumstances under national space legislation, for instance the SPOT 7 satellite, initially registered by France in 2016, was transferred to and registered by Azerbaijan in December 2016 and was therefore removed from the French National Register.[297]

D. Chapter Conclusion

In this Chapter, six aspects of the basic content of national space legislation have been identified based on the ILA Model Law and the NatLeg Resolution. Regulations on the scope of application and jurisdiction, authorization and the conditions for authorization, continuing supervision and enforcement, registration, recourse and insurance and the transfer of space activity should constitute the backbone of national space legislation. The status of the regulations thereon is unwavering, no matter what kind of new developments take place.

Specific concerns as regard to the basic content have been analyzed in a detailed manner. The scope and jurisdiction of space activities are not static;

[297] UN Doc. ST/SG/SER.E/797, Information furnished in conformity with the Convention on Registration of Objects Launched into Outer Space, Note verbale dated 27 March 2017 from the Permanent Mission of France to the United Nations (Vienna) addressed to the Secretary-General, 1 August 2017, p. 2, Annex VI, Additional information provided by France in conformity with article IV, paragraph 2, of the Convention on Registration of Objects Launched into Outer Space on space objects registered by France as at 31 December 2015,Table 1, Satellites registered by France and operating in low Earth orbit, p.22.

provisions accordingly should make room for what will happen in space activities in the future. The mitigation of space debris should be highly emphasized as one of the authorization conditions due its urgent nature in terms of the current state of affairs. Identifying the registration State where there is more than one launching State should be regulated for by way of specific provisions and information on space objects for the purpose of registration should not be limited by what is written in the REG. States enjoy a large margin of discretion in deciding the means of the supervision and monitoring of space activities; meticulous provisions should be predictable for private partners. A limited recourse of States is necessary for balancing the interests of States and the private sectors. Transfer of the space activity should be authorized by States, especially in-orbit transfer, in order to realize continuing supervision of the space object by States.

When China is making its national space legislation, these basic contents should indisputably all be included. Moreover, details which have been amended by existing State practice should be considered. Meanwhile, the flexibility for dynamic national space legislation should be sufficiently allowed for.

Chapter III. New Content in Recent National Space Legislation: Focusing on Three Aspects

International space law, especially the generally accepted four international space treaties, prompts State parties to take domestic measures (e.g. to enact national space legislation) in order to cope with their obligations under these space law treaties and to authorize and continually supervise their private space activities.[298] In the last two chapters of the present research, common basic content of existing national space legislation has been summarized. Both the ILA and the UNCOPUOS have released documents based on this common basic content for the purpose of providing guidance to the States that have not yet enacted national regulations pertaining to space activities. However, the inexorable growing trend of space privatization, as well as space commercialization, brought and still brings legal challenges to space law.[299] What many consider impossible or not urgent today could quickly become reality tomorrow. Accordingly, new regulations are needed in order to approach the challenges.

In the last five years, the willingness of States to enact national space law has become much greater. The rationale behind these recent domestic regulations is nothing but the eagerness to develop and promote the domestic commercial space sectors. Some States, as new players, want to take advantage of the economic and innovation opportunities offered by space legislation. Denmark launched the 2016 Outer Space Act[300] to create a private interest in outer space activities for its citizens. New Zealand fostered

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[298] See: Kerrest, Armel, *Status of the Implementation of National Space Legislation and the Results of the Project 2001 Plus Working Group,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), 'Project 2001 Plus'-Global and European Challenges for Air and Space Law at the Edge of the 21st Century, Carl Heymanns, Cologne, 2006, pp. 51-64. see also: Linden, Dimitri, *The Impact of National Space Legislation on Private Space Undertakings: Regulatory Competition vs. Harmonization,* Journal of Science Policy & Governance (1) 2016, online at: www.sciencepolicyjournal.org.

[299] Dimitri Linden, ibid.

[300] Denmark's Outer Space Act passed by the Parliament of Denmark on May 3, 2016, the content of this Act is available at: https://ufm.dk/en/legislation/prevailing-laws-and-regulations/outer-space/outer-space-act.pdf. More comments can be found in the *"A comprehensive first look at Denmark's domestic space law"* by Listner, Michael Tuesday, May 31, 2016, at: http://www.thespacereview.com/article/2994/1.

around 70 different space-related businesses and other entities in 2018[301] after adopting the 2017 Outer Space and High-Altitude Act.[302] Some States feel that the old legislation on space activities cannot meet the demands of recent changes, such as Australia,[303] which made an amendment to its existing law to adapt to changing technological advancement. Some States, through the enactment of new statutes, enlarge the scope of national space legislation. For example, the U. S. legislated to authorize its citizens to exploit and appropriate asteroids' resources. The UK included sub-orbital flights and the private operation of spaceports into new space law governing domestic space activities, together with the 1986 Space Act.[304] Many other States are also embarking on the course of national space legislation. India released its Space Activities Bill in 2017.[305] Portugal announced it would create space law considering the comparative experience of countries such as the United Kingdom, France and Luxembourg, among others, in its space policy, "Portugal Space 2030".[306]

Among all of thess new State practice, the extent of the scope of space activities needs to be focused as it affects the substantive content of national space regulations. The present Chapter discusses the national legislation on outer space resources, sub-orbital flights and spaceports. Legislation on outer space resources challenges the principles of international space law.

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[301] Jenkins, Kevin, *The Space Race: NZ's Push into a $320 Billion Market,* available at: https://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=12016132.

[302] Outer Space and High-altitude Activities Act 2017, available at: http://www.legislation.govt.nz/act/public/2017/0029/48.0/DLM6966275.html.

[303] Amending the Space Activities Act 1998 to broaden the current regulatory framework to include arrangements for launches from aircraft in flight and the launches of high power rockets; and to reduce barriers to participation in the space industry by streamlining processes and insurance requirements for launches and returns; and amend the short title of the Act to the Space (Launches and Returns) Act 2018; and Customs Tariff Act 1995 to make a consequential amendment. https://www.aph.gov.au/Parliamentary_Business/Bills_Legislation/Bills_Search_Results/Result?bId=r6129.

[304] The Outer Space Act 1986 regulates activities carried out by UK entities overseas: i.e. the launch and procurement of a space object, the operation of a satellite in orbit, see Introduction (3) of the Space Industry Act 2018.

[305] India's first Space Law, Draft Space Activities Bill 2017, was unveiled at the end of 2017. The new Bill is expected to allow both public and private players to participate in India's Space Program. It will allow private players to build satellites, rockets, and space vehicles for both domestic and global use. Primarily, the new Bill will promote and regulate space activities in India. Currently, the draft bill has been on the website of the Indian Space Research Organization (ISRO) for public comments. After receiving comments from the stakeholders and the public, the Bill will go to Parliament for approval: https://www.gktoday.in/gk/draft-space-activities-bill-2017/.

[306] *Portugal Space 2030, A Research, Innovation and Growth Strategy for Portugal,* available at: https://www.fct.pt/documentos/PortugalSpace2030_EN.pdf.

Legislation on sub-orbital flights sheds some light on its uncertain pending status. Legislation on spaceports alerts the space players of the commercial arena which will be the main battlefield in the future.

A. National Legislation on Asteroid Resource Mining: Focusing on the Newly Enacted Space Acts of the U.S. and Luxembourg

On November 25th, 2015, Space Resource Exploration and Utilization, Title IV of the U.S. Commercial Space Launch Competitiveness Act,[307] passed by the United States Congress, became effective, which established definitive property rights over space resources extracted by American citizens. A United States citizen engaged in the commercial recovery of an asteroid resource or a space resource under this Act shall be entitled to the rights to possess, own, transport, use, and sell such resources obtained in accordance with the applicable law, including the international obligations of the United States.[308] Then, Luxembourg, the competitive ability of which is limited in the field of outer space technology, became the first European State to offer a legal framework ensuring that private operators can be confident about their property rights to the resources extracted in outer space. The Law on the Exploration and Use of Space Resources [309] adopted by Luxembourg's Parliament, came into force on August 1st, 2017. After the adoption of the US Space Act of 2015, a heated debate swept academia. Before proceeding with an analysis of this huge debate, it would be wise to learn of the key reasons behind the adoption of these laws of the US and Luxembourg.

I. The Background to the Adoption of the "Space Resource Act" by the U.S. and Luxembourg

The huge value contained in outer space, especially with regard to asteroids, is always motivating mankind to explore and utilize outer space, including the Moon and other celestial bodies. According to the information provided

[307] U.S. Commercial Space Launch Competitiveness Act, Pub. L. No. 114-90, 129 Stat. 704 (2015).
[308] See U.S. Commercial Space Launch Competitiveness Act, Pub. L. No. 114-90, 129 Stat. 704 (2015).
[309] Draft Law on the Exploration and Use of Space Resources, available online at: http://www.spaceresources.public.lu/content/dam/spaceresources/pressrelease/2017/2017_07_13%20PressRelease_Law_Space_Resources_EN.pdf.

by NASA, there are potentially 100,000 near-Earth objects, including asteroids and comets, in the neighborhood of the Earth. In the year 2000, NASA managed to get a probe into a near-Earth asteroid's orbit and in 2001 it managed to land on the rock.[310] It is estimated that some of the near-Earth objects are substantial and potentially packed full of water and various important minerals, such as platinum, nickel, cobalt, and iron.[311] Industry experts predicted that the contents of a single asteroid could be worth trillions of dollars and asteroid mines will harvest platinum group metals in higher concentrations than any mine on Earth.[312] Stimulated by such huge economic benefits, several private companies have focus their attentions on asteroids and already engaged themselves in asteroid mining. What brings asteroid mining much closer to the reality is that, in mid-July 2015, an asteroid that is suspected of containing 90 million tons of platinum in its core passed by the Earth 30 times closer than the nearest planet of the solar system.[313] If technology had been mature enough back then, this would have constituted an unparalleled opportunity for asteroid mining.

1. Private Entities are Achieving the Capacity to Mine Asteroids

Among those who are developing technologies to facilitate the extraction of resources from asteroids, two major companies are the most valuable and will be briefly introduced, namely, Deep Space Industries (DSI)[314] and Planetary Resources (PR).[315] These two corporations are both international asteroid mining companies and have offices in the USA and Luxembourg. Together with other sectors, they were both selected by NASA to conduct a study

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[310] Dick, Steven J., *Voyages to the Asteroids,* 3rd June 2006, available at: https://www.nasa.gov/exploration/whyweexplore/Why_We_18.html.

[311] Steigerwald, William, *New NASA Mission to Help Us Learn How to Mine Asteroids,* 8th August 2013, available at: https://www.nasa.gov/content/goddard/new-nasa-mission-to-help-us-learn-how-to-mine-asteroids.

[312] Patel, Neel V., *Asteroid Mining Could Be a Multi-Trillion Dollar Business by 2020,* 28th June 2017, available at: https://www.inverse.com/article/33556-asteroid-mining-multi-trillion-dollar-business-asteroid-day-2017.

[313] *"Platinum" Asteroid Potentially Worth $ 5.4 Trillion To Pass Earth on Sunday,* at RT.com, published on 18 July 2015, available at: https://www.rt.com/news/310170-platinum-asteroid-2011-uw-158/.

[314] For more specifics regarding "Deep Space Industries", please see the official website of the company, available at: http://deepspaceindustries.com/company/.

[315] A specific introduction to the "Planetary Resources" company can be found at: https://www.planetaryresources.com/.

related to NASA's Asteroid Redirect Mission focusing on a government-private partnership towards "exploration and exploitation of space resources".[316]

In-space delivery of the right materials, to the right place, for the right price, to support the sustainable expansion of the Earth's economy into space is the goal of DSI because the continuing rapid growth of in-space businesses will increase the need for an in-space supply of propellants, life support materials, metals, and other commodities.[317] DSI has a four phase deep space approach to asteroid mining.[318] Currently, DSI is in its first phase, which is called "prospecting", to accomplish the target of this phase, the DSI has to use advanced, tiny spacecraft to directly explore and study Near Earth Asteroids.[319] To harvest resources by using robotic spacecraft is the second phase that will utilize water extracted from the target asteroid as the propellant for the return trip.[320] The third phase is processing, in which harvesting spacecraft will unload their cargo to a processing complex that commences the detailed separation and evolution of materials, preparing them for manufacturing.[321] The final phase is manufacturing.[322] Once the materials are in the Earth's orbit, they can be processed into valuable products such as fuel, water and oxygen.[323]

Similarly, Planetary Resources holds that there is a large market for rocket fuel in space and producing rocket fuel in space will "open the interplanetary equivalent of exploration era trade routes."[324] Planetary Resources plans to achieve its goal by breaking the technical process of

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316 Mahoney, Erin (ed.), *NASA Selects Studies for the Asteroid Redirect Mission,* NASA.gov (June 19, 2014), available at: https://www.nasa.gov/content/nasa-selects-studies-for-the-asteroid-redirect-mission.

317 On the business of Asteroid Mining of Deep Space Industries, please see the fundamental introduction on its official website, available at: http://deepspaceindustries.com/mining/.

318 Ibid.

319 Ibid.

320 Ibid.

321 Ibid.

322 Ibid.

323 Myers, John, *Extraterrestrial Property Rights: Utilizing the Resources of the Final Frontier,* San Diego International Law Journal (18) 2016, p. 84.

324 *Harvesting Water from Asteroids, Planetary Resources,* available at: http://www.planetaryresources.com/asteroids/#harvesting-water.

asteroid mining down into a series of more manageable, viable and profitable steps.[325] Measuring resources on water-rich asteroids in order to determine if a particular asteroid is worth pursuing is the first step.[326] The second step is producing fuel in space from the harvested water of near-Earth asteroids to increase the payload capacity of rockets enables the creation of a space highway with fuel depots located at various points of need throughout the Solar System, and allows spacecraft to travel much farther.[327] Most importantly, this fuel will enable the final step, mining asteroids for structural and precious metals.[328] Structural metals will be harvested and used as construction materials in space. Precious metals will be used for in-space manufacturing of high-end electronics, laboratory equipment and spacecraft components.[329]

To sum up, currently, more than one non-governmental entity has the capacity to exploit the resources on asteroids directly, and they have made specific plans for directing mining progress. Moreover, although both the DSI and PR intend to exploit resources on asteroids, they may develop a different business strategy to obtain revenue. Thus, at the first stage of asteroid mining, these two corporations wished to cooperate rather than compete. As a result, an asteroid will probably be exploited much faster than anticipated, which requires the creation of a comprehensive legal framework as soon as possible.

2. The Shortcoming of Regulations to Guarantee the Property Rights Relating to Extracting from Asteroids and the Adoption of the U.S. 2015 Space Act as a Solution

Both DSI and PR have already made significant progress. They are generating revenue from commercial contracts, as well as government and university research projects. However, these asteroid mining companies quickly found

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[325] Myers, John, *Extraterrestrial Property Rights: Utilizing the Resources of the Final Frontier,* San Diego International Law Journal (18) 2016, p. 86.

[326] Planetary Resources' First Spacecraft Deployed, Planetary Resources (July 16, 2015), available at: http://www.planetaryresources.com/2015/07/planetary-resources-first-spacecraft- deployed/.

[327] Water-the Key Resource in Space, available at: https://www.planetaryresources.com/products/.

[328] Myers, John, *Extraterrestrial Property Rights: Utilizing the Resources of the Final Frontier,* San Diego International Law Journal (18) 2016, p. 86.

[329] Water-the Key Resource in Space, available at: https://www.planetaryresources.com/products/.

that many potential investors who understood that there is indeed colossal money to be made were nevertheless anxious. People questioned whether extracting such minerals was allowed and whether their right could be guaranteed because there wasn't much precedent.[330] The solution to ease these companies' worries was the passage of a bill which would effectively legitimize asteroid mining from an American legal perspective.[331] In 2013, PR hired a veteran lobbying firm to advance its cause on Capitol Hill.[332] In July 2014, Bill Posey, a Republican representative from Florida, and Derek Kilmer, a Democratic representative from Washington, introduced a bill to the House that they called the Asteroids Act,[333] stating that the legislation would help promote private exploration and protect commercial rights as these endeavors move forward.[334] Over the next year, PR representatives travelled regularly to Washington, D.C., to meet with legislators and congressional aides. They were joined on the Hill by DSI, as well as Bigelow Resources. These companies all wanted a legal framework that would guarantee their future claims on asteroid mining though they may have also been competitors in some sense. In 2015, their lobbying efforts paid off. The Asteroids Act was rolled into a larger bill called the U.S. Commercial Space Launch Competitiveness Act.[335]

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[330] Kfir, Sagi/Perry, Ian, *Title IV of the U.S. Commercial Space Launch Competitiveness Act of 2015,* in: IISL Proceedings of the International Institute of Space Law 2016, Eleven International Publishing, The Hague, 2017, pp. 170-171.

[331] Ibid.

[332] Shaer, Matthew, *The Asteroid Miner's Guide to the Galaxy U.S. companies are preparing to tap the solar system's riches. But will they share the trillion-dollar deep-space market with hungry foreign competitors?* 28th April 2016, available at: http://foreignpolicy.com/2016/04/28/the-asteroid-miners-guide-to-the-galaxy-space-race-mining-asteroids-planetary-research-deep-space-industries/.

[333] Planetary Resources' home state of Washington is also home to three of the Act's eighteen co-sponsors, including its original sponsor, Congressman Derek Kilmer. See List of Co-Sponsors, Congress.gov, available at: https://www.congress.gov/bill/113th-congress/house-bill/5063/cosponsors.

[334] Shaer, Matthew, *The Asteroid Miner's Guide to the Galaxy U.S. companies are preparing to tap the solar system's riches. But will they share the trillion-dollar deep-space market with hungry foreign competitors?* 28th April 2016, available at: http://foreignpolicy.com/2016/04/28/the-asteroid-miners-guide-to-the-galaxy-space-race-mining-asteroids-planetary-research-deep-space-industries/.

[335] Ibid.

II. The Legal Implications of National Regulations on Asteroid Resources

The 2015 Space Act of the United States evoked universal controversy. Whether or not it violates the international space non-appropriation principle and whether it can constitute an interpretation of the Outer Space Treaty are two topics of discussion.

1. Violation of the Outer Space Treaty?

Article II of the Outer Space Treaty states:

"Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."[336]

This provision is seen as the core provision in international space law. It established the non-appropriation principle for outer space meaning that outer space cannot be appropriated by any country. Fierce argument surrounding this epicenter has resulted in two different propositions.

On the one hand, some believe that sufficient ambiguities exist in Art. II to allow the United States to grant the ownership rights of extracted asteroid resources to private industry.[337] The prohibition on the "national appropriation" of outer space forbids the appropriation of territory, but not of natural resources.[338] It does clearly prohibit appropriation of whole celestial bodies but is far less clear concerning rights over extracted resources.[339] The term "celestial body" has no specific and firm legal definition and whether "celestial body" applies to all natural objects including asteroids or only to planets is also unclear.[340] It is furthermore emphasized that a disclaimer on

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[336] Art. II of the Outer Space Treaty.

[337] Stromberg, Joseph, *Is Asteroid Mining Legal? Congress Wants to Make it So.,* Vox (Sept. 11, 2014), available at: http://www.vox.com/2014/9/11/6135973/asteroid-mining-law-polic.

[338] Gabrynowicz, Joanne, *Written Testimony of Joanne Irene Gabrynowicz Before the Subcommittee on Space of the Committee on Science, Space, and Technology United States House of Representatives* at 7 (10 Sep. 2014), available at: http://science.house.gov/sites/republicans.science.house.gov/files/documents/Gabrynowicz %20Final%20Testimony%20H.R.%205063.pdf.

[339] Kfir, Sagi/Perry, Ian, *Title IV of the U.S. Commercial Space Launch Competitiveness Act of 2015,* in: IISL Proceedings of the International Institute of Space Law 2016, Eleven International Publishing, The Hague, 2017, pp.171-172.

[340] Tennen, Leslie I., *Towards A New Regime for Exploitation of Outer Space Mineral Resources,* Nebraska Law Review (88) 2010, pp. 796-797.

the territorial sovereignty of States embodied in Art. II doesn't mean that States also cannot claim national jurisdiction.[341] In particular, Art. VI and Art. VIII of the Outer Space Treaty affirmatively grants to States "jurisdiction and control" over space objects on their registries. Any extension of jurisdiction does not constitute a *de facto* extension of sovereignty.[342]

On the contrary, there is another very strict view providing that the Outer Space Treaty prohibits any kind of exclusive rights to outer space and celestial bodies and it thus designates and characterizes outer space as an international common,[343] and, as is expressed in Art. II, any kind of use also includes use by way of the taking of resources. The lack of detailed rules regulating every conceivable activity in space should thus not be taken as an indication that there are forms of the exploration or use of outer space that escape the application of the fundamental principles of international space law.[344] Moreover, outer space and celestial bodies, including their resources, are global commons under the sole jurisdiction of the international community of States and do not fall under any State's national jurisdiction.[345] States do not have the power to prescribe rules determining the legal status of natural resources in outer space on the grounds that they would not be covered by the existing space treaties.[346] States retain personal jurisdiction over personnel and objects launched into outer space, which is supported by Art. VI OST mainly in order to ensure that activities carried out by them are in keeping with the rules that govern this environment, as adopted by the international community, *inter alia* because they will be internationally responsible for

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[341] Blount, P. J./Robison, Christian J., *One Small Step: The Impact of the U.S. Commercial Space Launch Competitiveness Act of 2015 on the Exploitation of Resources in Outer Space,* North Carolina Journal of Law & Technology (18) 2016, p. 181.
[342] Blount, P. J./Robison, Christian J., *One Small Step: The Impact of the U.S. Commercial Space Launch Competitiveness Act of 2015 on the Exploitation of Resources in Outer Space,* North Carolina Journal of Law & Technology (18) 2016, p.181.
[343] Hobe, Stephan/de Man, Philip, *National Appropriation of Outer Space and State Jurisdiction to Regulate the Exploitation, Exploration and Utilization of Space Resources,* German Journal of Air and Space Law (3) 2017, p. 460.
[344] De Man, Philip, *State Practice, Domestic Legislation and the Interpretation of fundamental principles of international space law,* Space Policy (42) 2017, p. 92.
[345] Hobe, Stephan/de Man, Philip, *National Appropriation of Outer Space and State Jurisdiction to Regulate the Exploitation, Exploration and Utilization of Space Resources,* German Journal of Air and Space Law (3) 2017, p. 475.
[346] Ibid., p. 470.

their activities.[347] Jurisdiction and control, reiterated in Art. VIII OST, aims to ensure the fulfilment of the State Parties' international responsibilities under Art. VI OST.

2. Interpretation of the Outer Space Treaty?

The international space treaties were concluded during the Cold War as a result of negotiations largely conducted between two major powers. However, the phenomenon, which more States and private sectors have become involved in, has led to space commercialization and privatization prevailing, and space technology surprisingly advancing. The context in which they operate is very different from the one in which they were conceived.[348] Some authors also began to discuss the diplomatic history of the Outer Space Treaty, which suggests that its drafters, seeking to prepare an agreement that could gain acceptance in both eastern and western blocs, deliberately chose to leave the possibility of private appropriation ambiguous.[349] Consequently, the interpretation, clarification and even modification of these old space treaties are very much necessary.

It has been accepted by most that there are ambiguities existing in the Outer Space Treaty. It remains in need of clarification. However, whether the 2015 U.S. Space Act can be used as an interpretation aid for the international space treaties is questionable.

Some authors argue that the 2015 Space Act represents the United States' understanding of its obligations under Art. II;[350] it can be read as an interpretation of the ambiguity, but not the only interpretation. The interpretation of international obligations is ultimately dependent upon the actions of various States as they engage in the process of fulfilling their treaty

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[347] Ibid., p. 469.

[348] As important treaties reach a certain age, the context in which they operate becomes different from the one in which they were conceived. As a result, it becomes more likely that some of these treaties' provisions will be subject to efforts of re-interpretation, and possibly even of informal modification. UN Doc. A/CN.4/660, First report on subsequent agreements and subsequent practice in relation to treaty interpretation, 19 March 2013, Annex A, para.14.

[349] See: Roth, Samuel, *Developing a Law of Asteroids: Constants, Variables and Alternative,* Columbia Journal of Transnational Law (54) 2016, pp. 841-842. see also: Reinstein, Ezra J., *Owning Outer Space,* Northwestern Journal of International Law & Business (20) 1999, p. 63.

[350] Blount, P. J./Robison, Christian J., *One Small Step: The Impact of the U.S. Commercial Space Launch Competitiveness Act of 2015 on the Exploitation of Resources in Outer Space,* North Carolina Journal of Law & Technology (18) 2016, p.177.

obligations. Following the 2015 Space Act, a chain reaction is predicted to occur among other States that have a stake in space resources, or wish to develop a stake in space resources, and these States will enact similar legislation.[351] The legislation practice of Luxembourg following the U.S. is a good example. Luxembourg has already created an alliance with seven States as it offers a legal framework recognizing that space resources can be used and establishing a process for the authorization and supervision of corresponding activities.[352] With more States acting or reacting on a domestic level, an analysis of the incremental growth of such domestic measures can assist in deciphering how Article II has been developed beyond its text with regard to resource extraction.[353]

However, this may be a fake excuse as technologically advanced States are perceived as turning their space law-making efforts into a national interpretation of the existing principles that further their own interests instead of engaging in protracted multilateral negotiation processes that risk upsetting the basic balance of the existing space law regime that favors them in the first place.[354] The international common feature of outer space intrinsically governed by the international community has been stealthily changed by such laws backed up by domestic interests. The sole actions of a handful of States can hardly be regarded, in fact not even at all, as an interpretation of the international space treaties.

3. The International Regime on Outer Space Resources

Comparably, the exploitation of space resources is similar to collecting

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[351] Myers, John, *Extraterrestrial Property Rights: Utilizing the Resources of the Final Frontier,* San Diego International Law Journal (18) 2016, p. 127.

[352] On 23 January 2019, Luxembourg and Belgium signed a joint declaration committing to collaborate on the development of an international framework for the exploration and utilization of space resources. Belgium became the 7th country to back Luxembourg in developing an international framework for space mining in a bid to leverage more private investment in this sector: https://spaceresources.public.lu/en/actualites/20191/the-grand-duchy-of-luxembourg-and-belgium-join-forces-to-develop-the-exploration-and-utilisation-of-space-resources.html.

[353] Blount, P. J./Robison, Christian J., *One Small Step: The Impact of the U.S. Commercial Space Launch Competitiveness Act of 2015 on the Exploitation of Resources in Outer Space,* North Carolina Journal of Law & Technology (18) 2016, p. 177.

[354] De Man, Philip, *State Practice, Domestic Legislation and the Interpretation of fundamental principles of international space law,* Space Policy (42) 2017, p. 92.

mineral resources of the seabed beyond the continental shelf.[355] The geographical location of this kind of resources is also in a territory where national sovereign claims are prohibited;[356] moreover, exploration is also impossible for now due to technical reasons. However, in contrast to outer space resources, the private appropriation of such resources by private entities is explicitly prohibited.[357] The natural resources of the seabed are governed by the legal regime of the Area, being defined as "the seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction,"[358] under Part XI of the United Nations Convention on the Law of the Sea (UNCLOS).

Another example of a territory that resists national sovereign claims is the Antarctic, as regulated by Art. IV para. 2 of the Antarctic Treaty and providing that this treaty is in force.[359] Activities relating to the mineral resources of the Antarctic are also explicitly prohibited except for scientific research.[360] There have been attempts to establish an international regime governing mineral resources. In the late 1980s, the international community discussed the possibility of the exploitation of Antarctic mineral resources under the Convention on the Regulation of Antarctic Mineral Resources.[361] However, this Convention was signed by 19 States but not ratified by a single state; therefore, the convention never entered into force.

Returning to outer space resources, which is not without an international regime in place to govern the topic. The most detailed and extensive

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[355] Blanchette-Seguin, Virginie, *Reaching for the Moon: Mining in Outer Space, International Law and Politics,* (49) 2017, p. 967.

[356] See, Art. 137, para. 1 of the United Nations Convention on the Law of the Sea (adopted on 10 December 1982, entered into force on 16 November 1994, 1833 UNTS 3), hereinafter referred to as UNCLOS, "No State shall claim or exercise sovereignty or sovereign rights over any part of the Area or its resources, nor shall any State or natural or juridical person appropriate any part thereof. No such claim or exercise of sovereignty or sovereign rights nor such appropriation shall be recognized."

[357] See Art. 137, para. 3 of the UNCLOS, "No State or natural or juridical person shall claim, acquire or exercise rights with respect to the minerals recovered from the Area except in accordance with this Part. Otherwise, no such claim, acquisition or exercise of such rights shall be recognized."

[358] Art. 1, para. 1 of the UNCLOS.

[359] Art. IV para. 2 of the Antarctic Treaty (adopted on 1 December 1959, entered into force 23 June 1961, 402 UNTS 71), "No acts or activities taking place while the present Treaty is in force shall constitute a basis for asserting, supporting or denying a claim to territorial sovereignty in Antarctica or create any rights of sovereignty in Antarctica. No new claim, or enlargement of an existing claim, to territorial sovereignty in Antarctica shall be asserted while the present Treaty is in force."

[360] Art. 7 of the Protocol on Environmental Protection to the Antarctic Treaty (signed on 4 October 1991, entered into force on 14 January 1998, 30 ILM 1455).

[361] Convention on the Regulation of Antarctic Mineral Resource Activities, concluded on 2 June 1988, opened for signature on 25 November 1988.

provisions relating to the use of outer space resources are set forth in Article 11 of the Moon Agreement. This article provides that no part of the Moon, its surface, or subsurface, nor any nature resources in place, shall become the property of any State, any organization, or non-governmental entity, or of any natural person.[362] It is a clarification of Article II of the Outer Space Treaty.[363] In Art. 11, State Parties are required to 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.[364] This article identifies one of its main purpose to establish an international regime so as to equally share the benefits derived from those resources between all State Parties.[365] The primary reason deterring States accepting this treaty is probably this mandatory sharing of benefits.[366]

It seems that diverse legal regimes confront the same difficult question on the exploration and distribution of natural resources due to the extremely complicated contexts and they are all struggle to reach a consensus. The major space law treaties, indeed, do not contain any specific rule dealing with the use of extraterrestrial resources, and thus there is no clear-cut regime dealing with it, which has received the general acceptance of States.[367] The question surrounding a more precise international regulation of such use has basically been left for the future when the international community comes up with an agreement on the conditions for such exploration.[368] Against this background, it is anticipated that, before a comprehensive international framework is finally enacted, domestic regulation, will prove to be the best choice for regulating space resource mining activities. The practice of the 2015 Space Act has been regarded as being helpful to commercial interests by providing

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[362] Art. 11(3) Moon Agreement

[363] Tennen, Leslie I., *Enterprise Rights and the Legal Regime for Exploitation of Outer Space Resources,* the University of the Pacific Law Review, (47) 2016, p. 290.

[364] Art. 11(5) Moon Agreement

[365] Art. 11(7) Moon Agreement

[366] Tennen, Leslie I., *Enterprise Rights and the Legal Regime for Exploitation of Outer Space Resources,* the University of the Pacific Law Review, (47) 2016, p. 291.

[367] Tronchetti, Fabio, *The Exploitation of Natural Resources of the Moon and Other Celestial Bodies: A Proposal for a Legal Regime,* Brill/ Nijhoff, 2009, Leiden, pp. 3-4.

[368] Hobe, Stephan/de Man, Philip, *National Appropriation of Outer Space and State Jurisdiction to Regulate the Exploitation, Exploration and Utilization of Space Resources,* German Journal of Air and Space Law (3) 2017, p. 465.

for explicit rights for private operators. It adds a level of legal certainty to the prospects of space resource harvesting in the eyes of investors and also provides a solid foundation for building additional supportive regulatory frameworks in the United States and elsewhere for commercial lunar and other space resource focused activities of the private sector.[369] Eventually, one would hope, the growth in domestic regulation might influence the development of both customary and conventional international space law, and motivate the international community to establish harmonized regulatory standards.[370]

B. National Legislation on Sub-orbital Flights: Taking the 2018 UK Space Industry Act as an Example

In February 2017, a Draft Spaceflight Bill was presented to the UK Parliament by the Secretary of State for Transport.[371] The Space Industry Act 2018,[372] the updated version, rendered the Bill law on 8th March 2018.[373] The UK's new national space legislative process has attracted a lot of attention. From a national space legislation perspective, there are two significant points in this Act worthy of being discussed. The first point is sub-orbital flights; the second one is the regulations on spaceports. Before jump into the specific points, a brief summary of the 2018 UK Space Industry Act will be provided.

I. An Overview of the 2018 UK Space Industry Act

Compared with the Outer Space Act 1986, the 2018 UK Space Industry Act

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[369] Masson-Zwaan, Tanja/Richards, Bob, *International Perspectives on Space Resource Rights,* 8th December 2015, available at: http://spacenews.com/op- ed-international-perspectives-on-space-resource-rights/.

[370] See Blount, P. J., *Renovating Space: The Future of International Space Law*, Denver Journal of International Law and Policy, Vol. 40, 2011, p. 531.

[371] The UK Draft Spaceflight Bill is available at: https://www.gov.uk/government/publications/draft-spaceflight-bill.

[372] A Bill is a law in draft form; it becomes an Act if it is approved by a majority in the House of Commons and House of Lords, and is formally agreed to by the reigning monarch (known as Royal Assent). An Act of Parliament is a law, enforced in all areas of the UK where it is applicable. For more information, please see: https://www.parliament.uk/business/bills-and-legislation/.

[373] *New Laws Unlock Exciting Space Era for UK,* 15 March 2018, available at: https://www.gov. uk/ government/news/new-laws-unlock-exciting-space-era-for-uk.

is quite long.[374] It provides for the implementation of a regulatory framework and licensing scheme to enable private commercial spaceflight activities, including space activities and sub-orbital activities,[375] to occur from UK spaceports. It covers traditional vertical launches and is likely to accommodate horizontal launches.[376] Regulations for establishing safety, training and informed consent requirements for individuals participating in spaceflight activities also constitute an important part of the new Act. Additionally, the Act enables the imposition of civil sanctions for non-compliance with regulations, authorizes the creation of space-related criminal offences and addresses issues of liability.

On the whole, the Act has been welcomed by UK nationals. The main criticism of it is the lack of detailed policy, which will establish a framework for further policy to be delivered by regulation and/or guidance. The absence of a mandatory cap on liability for spaceflight operators is the main concern raised by industry stakeholders.[377] Regarding these issues mentioned above, a call for evidence to inform as to the further policy development of the Space Industry Act 2018's provisions on liability, insurance and charging was published by the UK government on the 27th March 2018.[378] This will assist in paving the way for a new revised version of the Act.

II. Fundamental Reasons for the 2018 UK Space Industry Act Emphasizing Sub-orbital Flight

Regarding the act's current context, the UK is experiencing a period of great change signaled by its departure from the European Union. Despite the

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[374] The Outer Space Act 1986 is available at: https://www.legislation.gov.uk/ukpga/1986/38/pdfs/ukukpga_19860038_en.pdf; a summary of this Act can be found in: Department for Business, Innovation& Skills, *Reform of the Outer Space Act 1986: Summary of Responses and Government Response to Consultation,* 06 December 2013, p. 5, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/295769/gov-response-osaconsultation.Pdf.

[375] See: Regulation of Spaceflight etc Section 1 (1), Space Industry Act 2018.

[376] Ayetey, Julia S., *Black Holes in the Proposed UK Space Legislation,* Jurist- Academic Commentary, 11 December 2017, available at: http://jurist.org/forum/2017/11/Selman-Ayetey-uk-space-legislation.php.

[377] House of Commons Library, The Space Industry Bill 2017-2019, available at: http://researchbriefings.parliament.uk/ResearchBriefing/Summary/CBP-8197.

[378] For more information, please see: https://www.gov.uk/government/publications/call-for-evidence-space-industry-act-2018.

challenges and uncertainties of Brexit, the UK is keen to emphasize the space sector's role as a driver for domestic economic growth.[379] The global space market was valued at $329 billion in 2016[380] and private sub-orbital flights and the launches of small satellites alone are forecast to be worth £25 billion over the next 20 years.[381] The UK government clearly views the space launch market as a lucrative area, able to facilitate dramatic growth in the nascent UK space manufacturing and operations sector.[382] This new legislation, which will be fundamental to enabling small satellite launches and sub-orbital flights from UK spaceports, will work with the space industry, in aiming to establish the UK as a world-leading destination for space launchs, ensuring the UK is well-placed to take advantage of the growing global market, while in the meantime, creating high-skilled job opportunities up and down the supply chain in satellite technology, aerospace, transport, tourism and in communities that have not previously considered themselves to be part of the space sector.[383] The UK government wants to work to create a regulatory structure that empowers innovation, embraces opportunity and ensures UK launch activity is carried out safely and responsibly.[384]

In general, the government of the UK believes that developing sub-orbital flight is an effective measure to provide more opportunities for the country to gain impressive benefits from outer space activities, meanwhile, facilitating the development of the space industry as a whole. Accordingly, the 2018 Space Industry Act was created to include relevant provisions. However, it is necessary to note that to regulate sub-orbital flight under the

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379 Worthy, John, *The UK Staking its Claim in the Future of Space – Brexit and Beyond,* Fieldfisher, 09 March 2017, available at: http://www.fieldfisher.com/publications/2017/03/satellite-finance-february-2017-the-uk-staking-its-claim-in-the-future-of-space-brexit-and-beyond#sthash.rB79Crvc.dpbs.

380 Space Foundation Report Reveals Global Space Economy at $329 Billion in 2016, Space Foundation Release, 03 August 2017, available at: https://www.spacefoundation.org/news/space-foundation-report-reveals-global-space-economy-329-billion-2016.

381 *Introduction of Space Industry Bill Shows UK's Commitment to Commercial Spaceflight,* 28 June, 2017, available at: https://www.gov.uk/government/news/introduction-of-space-industry-bill-shows-uks-commitment-to-commercial-spaceflight.

382 Newman, Christopher J., *The Draft UK Spaceflight Bill 2017: Bold Vision or Future Imperfect?* The Precis (XI) 2017, available at: http://nrl.northumbria.ac.uk/33822/1/dsb2016%20sure.pdf.

383 Foreword, the Draft Spaceflight Bill 2017.

384 *New Laws Unlock Exciting Space Era for UK,* 15 March 2018, available at: https://www.gov.uk/government/news/new-laws-unlock-exciting-space-era-for-uk.

framework of national space law provokes several legal issues.

III. Specific Legal Concerns of Sub-orbital Flight/Tourism

1. The Legal Definition of Sub-orbital Flight

On the international plane, there is no international definition of sub-orbital flights. The International Civil Aviation Organization (ICAO), however, describes a sub-orbital flight as "a flight up to a very high altitude which does not involve sending the vehicle into orbit".[385] Based on this description and until an internationally agreed definition or description can be found, a generally acceptable formulation of such a definition is "a flight up to a very high altitude without completing one or several orbits around the Earth".[386] However, there is no standard agreed on the specific altitude yet.

The 2018 UK Space Industry Act has effect for the purpose of regulating space activities and sub-orbital activities carried out in the United Kingdom.[387] "Sub-orbital activity" is defined as "launching, procuring the launch of operating or procuring the return to earth of a rocket or other craft that is capable of operating above the stratosphere, or a balloon that is capable of reaching the stratosphere carrying crew or passengers[388] or an aircraft carrying such a craft, but does not include space activity."[389] This Act provides a much clearer and specific definition compared with ICAO's. Furthermore, the Act explicitly holds that spaceflight activities include space activities and sub-orbital activities.[390]

The issue regarding sub-orbital flights has long been a debated area in space activities. Most national space legislation remains silent on the issue of sub-orbital flights, while only a few nations have clear attitudes. However, the clear attitudes under different domestic space laws are not the same as other. Some accept the sub-orbital flight as a space activity, some exclude it.

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[385] C-WP/12436, Concept of Sub-orbital Flights, International Civil Aviation Organization Working Paper, Council, 175th Session.

[386] UN Doc. A/AC.105/1039/Add.9, Questions on Suborbital Flights for Scientific Missions and/or for Human Transportation, Committee on the Peaceful Uses of Outer Space, 6 February 2017.

[387] Introduction Part of the Space Industry Act 2018.

[388] Section 1 (5) of the Space Industry Act 2018.

[389] Section 1 (4) of the Space Industry Act 2018.

[390] Ibid.

For example, the USA basically accepts the sub-orbital flight as a space activity and has specific regulations regarding issuing permits via the Federal Aviation Administration (FAA).[391] In contrast, Belgium excludes suborbital flights from the scope of space law.[392]

2. The Delimitation of Outer Space and the Application of Laws

The word "stratosphere" in the definition of sub-orbital flights again raises the question as to the delimitation of outer space. This question has always been central with regard to the controversy over the applicability of laws.

While most domestic space legislation tends to avoid committing to defining the limits of space, the practice of the UK is regarded as unusual.[393] Some have seen this classification between a sub-orbital craft/ a balloon and an aircraft[394] as providing consolidation of a new boundary of space.[395] Moreover, the boundary chosen by the Act at which Aviation Law and Outer Space Law intersect is now significantly lower than the widely accepted 'Karman Line' of 100 km.[396]

Whether air law or space law is applicable to regulate sub-orbital flights seems hard to decide due to the hybrid nature of sub-orbital flights. Furthermore, establishing the delimitation of outer space would not solve this problem as sub-orbital flights would continue to be partly carried out in airspace and partly in outer space. Under these circumstances, for the individual State, it is only a matter of the choice to be taken considering its

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[391] The Federal Aviation Administration (FAA) was established in 1995. The office issues licenses and permits for commercial launches of orbital and suborbital vehicles. see: U.S. Department of Transportation Federal Aviation Administration, *The U.S. Commercial Suborbital Industry: A Space Renaissance in the Making,* p. 2, available at: https://www.faa.gov/about/office_org/headquarters_offices/ast/media/111460.pdf.

[392] An introduction to the relevant provision under Belgium law can be found in Marboe, Irmgard, *Paragraph 1 - Recommendation: Scope of Application, of the NatLeg Resolution,* in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume III, Carl Heymanns, Cologne, 2015, p. 561.

[393] Newman, Christopher J., *The Draft UK Spaceflight Bill 2017: Bold Vision or Future Imperfect?* The Precis (XI) 2017, available at: http://nrl.northumbria.ac.uk/33822/1/dsb2016%20sure.pdf.

[394] Section 1(4) of the Space Industry Act 2018.

[395] Newman, Christopher J., *The Draft UK Spaceflight Bill 2017: Bold Vision or Future Imperfect?* The Precis (XI) 2017, available at: http://nrl.northumbria.ac.uk/33822/1/dsb2016%20sure.pdf.

[396] For more information with respect to the "Karman Line", please see: *What is the Kármán Line?* 16 February 2017, available at: http://www.messagetoeagle.com/what-is-the-karman-line/.

own domestic needs. The delimitation issues should not turn into a barrier to the development of national and international legislation on sub-orbital flights.[397] The 2018 Act does provide a reference.

In addition to the delimitation of outer space and the application of laws, the issues surrounding liability,[398] outer space transportation,[399] environment,[400] security[401] of sub-orbital activities and themes regarding how international law copes with the issue of sub-orbital activities are widely discussed.[402] It has been concluded that regulatory advances at the national level may be distributed to other States through the sharing of best practices and lessons learned, as States are much more prone to act at the national level than in the context of an international organization or committee, given the close link between the space industry and the country in which it operates.[403]

3. Sub-orbital Tourism

Space tourism is an emerging segment of the adventure travel industry aiming to open up space flight to civilian participants as a commercial service.[404] Sub-orbital space tourism is likely to be the most common form of space tourism, at least in the short to medium term.[405] It refers to "space trips in

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[397] UN Doc. A/AC.105/1039/Add.9, Questions on Suborbital Flights for Scientific Missions and/or for Human Transportation, Committee on the Peaceful Uses of Outer Space, 6 February 2017.

[398] See for example, Smith, Lesley Jane, *Taking a Stance: Managing Liability for Commercial Space Activities,* in: Wouters, Jan/De Man, Philip/Hansen, Rik, (eds.), Commercial Uses of Space and Space Tourism: Legal and Policy Aspects, Edward Elgar Publishing Ltd, Cheltenham, 2017, pp. 19-43.

[399] See: Sikorska, Paulina E., *The Mission (Im)possbible: towards a Comprehensive Legal Framework Regulation Safety Issues of Point to Point Suborbital Flights,* Jurisprudence (4) 2014, pp. 1055–1078.

[400] See: Sameh, Mousavi S. M., *Suborbital Flights: Environmental Concerns and Regulatory Initiatives,* Journal of Air Law & Commerce (81) 2016, pp. 65-91.

[401] See for example, Sikorska, Paulina E., *The Mission (Im)possbible: towards a Comprehensive Legal Framework Regulation Safety Issues of Point to Point Suborbital Flights,* Jurisprudence (4) 2014, pp. 1055–1078.

[402] See for example, Freeland, Steven, *Fly Me to the Moon: How Will International Law Cope with Commercial Space Tourism?* Melbourne Journal of International Law (11) 2010, pp. 90-118. See also: Von der Dunk, Frans, *Space for Tourism? Legal Aspects of Private Spaceflight for Tourist Purposes,* in: Proceedings of the 49th Colloquium on the Law of Outer Space, 2006, pp. 18-28.

[403] Wouters, Jan/De Man, Philip/Hansen, Rik, (eds.), *Commercial Uses of Space and Space Tourism: Legal and Policy Aspects,* Edward Elgar Publishing Ltd, Cheltenham, 2017, p. xix.

[404] Smith, Garrett/Zervos, Vasilis, *A New European Spaceport Law and Politics in Spain,* in: Morris, Langdon (ed.), Space Commerce: The Inside Story by the People Who are Making it Happen, an Aerospace Technology Working Group Book, London, 2010, p. 287.

[405] Freeland, Steven, *Fly Me to the Moon: How Will International Law Cope with Commercial Space Tourism?* Melbourne Journal of International Law (11) 2010, p. 90.

which orbital velocities are not achieved and involves spacecraft flights that are more or less straight up and down, achieving an altitude of between 100 and 200 kilometers, after engine shutdown, passengers experience micro-gravity/weightlessness for about three to six minutes, after which the vehicle re-enters the atmosphere and returns to Earth."[406] Many high technology entrepreneurial companies are moving to exploit this emerging market by developing rocket powered vehicles to take participants on an out-of-this-world experience to the edge of space.[407] Blue Origin announced its plan to take tourists to space by April 2019.[408] Virgin Galactic has already taken a major step forward - the VSS Unity launched the first space tourism rocket on 5th April 2018.[409] Furthermore, the British domestic space tourism firm, the Starchaser, has launched the largest rocket for a test flight, which paved the way for space tourism.[410]

It has been recognized that the choice of the stratosphere as the boundary for the new licensing regime is clearly related to the desire of the UK to become home to the sub-orbital space tourism market.[411] This demonstrates that sub-orbital travel not only delivers to a distinctly high-value market, it is also currently providing an important back-up to government demand.[412]

In the new UK Act, sub-orbital activities share the same requirements as traditional space activities in terms of their licensing regime, safety, training and informed consent requirements for individuals participating, space-related civil sanctions, criminal offences and liability regimes. The legal issues related to sub-orbital tourism are also managed under this Act.

The Act provides regulations on information obligations, the informed

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406 Ibid.

407 Ibid.

408 Foust, Jeff, *Blue Origin Still Planning Commercial Suborbital Flights in 2018,* 5 April 2017, available at: http://spacenews.com/blue-origin-still-planning-commercial-suborbital-flights-in-2018/.

409 Details are available at: https://www.virgingalactic.com/articles/VSS-Unity-First-Powered-Flight.

410 *Space Tourism Firm Launches Largest Rocket to Blast off from UK Mainland,* available at: https://www.theguardian.com/science/2017/sep/11/largest-rocket-to-blast-off-from-uk-mainlandpaves-way-for-space-tourism.

411 Ibid.

412 Smith, Lesley Jane, *Taking a Stance: Managing Liability for Commercial Space Activities,* in: Wouters, Jan/De Man, Philip/Hansen, Rik, (eds.), Commercial Uses of Space and Space Tourism: Legal and Policy Aspects, Edward Elgar Publishing Ltd, Cheltenham, 2017, p. 21.

consent requirement and training and security measures for space tourism.[413] However, the crucial part in the regulatory framework for the safety of tourists - the regulation of informed consent- has been criticized.[414]

The notion of informed consent in respect of space tourism has long been a subject of debate,[415] the new UK Space Industry Act deals directly with this by introducing the concept for individuals participating in spaceflight activities.[416] The individual has to have signified his or her consent to accept the risks involved in such activities, and must fulfill prescribed criteria with respect to age and mental capacity before taking part in spaceflight activities. Consent to accept the risks involved in spaceflight activities must be signified by signing a 'consent form' that gives details of the risk assessment.[417] Critics have pointed out that the Act is silent on the crucial details as to what information the individual will be furnished with in order to render the consent informed.[418] Although the Act states that it will be dealt with under secondary legislation,[419] there are, at this stage, no statutory safeguards for the 'enthusiastic layperson,' who may not either full appreciate the extent of the risk associated with spaceflight or may be susceptible to companies preying on their understandable enthusiasm.[420]

The training, qualifications and medical fitness of space tourists taking

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[413] The UK is not the first State to provide regulations on space tourism, the United States has enacted the Commercial Space Launch Amendments Act of 2004, which provides some minimum requirements, more comments can be read in, Von der Dunk, Frans, *Space for Tourism? Legal Aspects of Private Spaceflight for Tourist Purposes,* in: Proceedings of the 49th Colloquium on the Law of Outer Space, 2006, p. 22. Also see: Hobe, Stephan, *Legal Aspects of Space Tourism,* Nebraska Law Review (86) 2007, p. 446.

[414] Newman, Christopher J., *The Draft UK Spaceflight Bill 2017: Bold Vision or Future Imperfect?* The Precis (XI) 2017, available at: http://nrl.northumbria.ac.uk/33822/1/dsb2016%20sure.pdf.

[415] See ibid, see also: Hobe, Stephan, *Legal Aspects of Space Tourism,* Nebraska Law Review (86) 2007, pp. 439-458; as well as Knutson, Tracey, *What is 'Informed Consent' for Space-Flight Participants in the Soon-to-Launch Space Tourism Industry,* Journal of Space Law (33) 2007, pp. 105-118.

[416] Newman, Christopher J., *The Draft UK Spaceflight Bill 2017: Bold Vision or Future Imperfect?* The Precis (XI) 2017, available at: http://nrl.northumbria.ac.uk/33822/1/dsb2016%20sure.pdf.

[417] More details can be found in Section 17 of the Space Industry Act 2018.

[418] Newman, Christopher J., *The Draft UK Spaceflight Bill 2017: Bold Vision or Future Imperfect?* The Precis (XI) 2017, available at: http://nrl.northumbria.ac.uk/33822/1/dsb2016%20sure.pdf.

[419] Regulations may make provision on the form and content of consent forms; information to be given to individuals before they sign consent forms; imposing evidential and procedural requirements with regard to the signification of consent: Section 17 of the Space Industry Act 2018.

[420] Newman, Christopher J., *The Draft UK Spaceflight Bill 2017: Bold Vision or Future Imperfect?* The Precis (XI) 2017, available at: http://nrl.northumbria.ac.uk/33822/1/dsb2016%20sure.pdf.

part in spaceflight activities are also emphasized in the Act.[421] However, detailed provisions still need to be provided in the secondary legislation.

In the absence of any authoritative guidance on the international level, space tourists have no effective remedy under International Law and must look to domestic law for protection.[422] Although the UK's new legislation has failed to provide more mature and detailed provisions which were expected to be created at the national level to ensure maximum protection for sub-orbital space tourists, it does push this valuable topic to the cusp for the international community to make concerted efforts to working this out.

C. National Legislation on Spaceports: Taking into Particular Account the 2018 UK Space Industry Act

Spaceports are crucial for commercial space transportation operations of orbital and sub-orbital flights. They provide the necessary facilities, ground control and runway/launch pads and, in the future, are also expected to host passenger training facilities, visitor centers, hotels and other types of attractions.[423] As is expected, the growth of commercial space services will encourage the adaption, refurbishment and even construction of new spaceport sites.[424] Some people also believe that the real future of space exploration is currently centered around dozens of commercial spaceports, financed by entrepreneurs inspired not only by profit but by the dream of creating a new space age, one not limited by bureaucracies or by budget allocations.[425]

In the United States, there are already several commercial spaceports.[426]

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[421] More details can be found in Section 18 of the Space Industry Act 2018.

[422] Bnos, Jessica Los, *Commercial Human Space Flight: Adequacy of the International Liability Regime Governing Suborbital Space Tourists,* in: Rao, Venkata R./Gopalakrishnan, V./Abhijeet, Kumar (eds.), Recent Developments in Space Law: Opportunities & Challenges, Springer, Singapore, 2017, p. 89.

[423] Van Pelt, Michel, *Space Tourism,* in: Tkatchova, Stella (ed.), Space- Based Technologies and Commercialized Development: Economic Implications and Benefits. IGI Global, Hershey, 2011, pp.164-176.

[424] Tkatchova, Stella, *Emerging Space Market,* Springer, Berlin, 2018, p.119.

[425] Seedhouse, Erik, *Spaceports Around the World, A Global Growth Industry,* Springer, Cham, 2017.

[426] For more details and comments see: Mineiro, Michael C., *Law and Regulation Governing U.S. Commercial Spaceports: Licensing, Liability, and Legal Challenges,* Journal of Air Law & Commerce, (73) 2008, pp. 759-805.

Certain European countries, like Sweden, have also already built a spaceport,[427] while others, like Portugal, Italy and Norway,[428] have mooted the idea and are performing feasibility studies for constructing national spaceports.[429]

I. Motivation for the New UK Space Law Concerning the "Spaceport"

Taking those European countries as competitors, the UK wants to seize the opportunity by providing stable legislation on the spaceport in order to become the hub for spaceflights in Europe.[430] Therefore, there is some urgency from the perspective of the UK to introduce the new legislation in order to first occupy the market in Europe and further increase its share of the global commercial space market to 10% by 2030.[431]

The UK has established expertise in the development and construction of small satellites, but it lacks independent launch capacity.[432] Currently, satellites must be launched into orbit from spaceports abroad, exposing British firms to substantial cost, delay and bureaucracy,[433] due to the lack of spaceports in the UK.

It is believed that the development of the Skylon single-stage-to-orbit space plane,[434] based around the SABRE hybrid engine,[435] has emboldened

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[427] For example, the spaceport in the Kiruna, find the details at: https://en.wikipedia.org/wiki/Space port_Sweden.

[428] In a letter to the Chair of the Science and Technology Committee, the Government explained the need for speed and also outlined the main provisions of the Draft Bill: [...] We face four strong competitors -Portugal, Sweden, Italy and Norway are also planning space port development and industry are speaking to all of these countries. [...] details are available at: http://data.parliament.uk/ writtenevidence/committeeevidence.svc/evidencedocument/science-and-technology-committee/the-draft-spaceflight-bill/written/48124.html.

[429] Tkatchova, Stella, *Emerging Space Market,* Springer, Berlin, 2018, p.119.

[430] *Satellites and space: Government Response to the Committee's Third Report of Session 2016–17,* available at: https://publications.parliament.uk/pa/cm201617/cmselect/cmsctech/830/83002.htm.

[431] For more details, please see: UK Space Agency, *Launch UK,* available at: https://assets.publishing .service.gov.uk/government/uploads/system/uploads/attachment_data/file/651077/LaunchUK_Prospectus.pdf.

[432] Newman, Christopher J., *The Draft UK Spaceflight Bill 2017: Bold Vision or Future Imperfect?* The Precis (XI) 2017, available at: http://nrl.northumbria.ac.uk/33822/1/dsb2016%20sure.pdf.

[433] Matthews, James/Correspondent, Scotland, *Spaceport Would Bring Opportunities for Britain,* 15 March 2018, available at: https://news.sky.com/story/spaceport-would-bring-opportunities-for-britain-11290229.

[434] Tate, Karl, *How the British Skylon Space Plane Works (Infographic),* on space.com, 3 March 2016, available at: https://www.space.com/32112-how-skylon-space-plane-works-infographic.html.

[435] More specifics regarding the SABRE hybrid engine can be found on its official website, available

UK legislators to establish the legislative framework for the establishment of UK spaceports.[436] As early as 2014, a British commercial spaceport competition was already held by the UK government to select a site to build a commercial spaceport.[437] Six sites were shortlisted for possible selection by 2015.[438] The competition ended without a selection in May 2016 and was replaced by a statement from the UK government regulatory agency that it would provide rules that allow a commercial spaceport to be built at any suitable location.[439]

Under the 2018 Space Industry Act, spaceports will be established in various regions across the UK. The Act establishes a regulatory framework for building and operating spaceports and enabling spaceflights to take place from the UK soil. Regulating the building and operation of commercial spaceports is not a pioneering effort, it has been done by a few States, for example the USA,[440] although the regulations are far fewer in number than those on airports as the building and operation of airports is heavily regulated in basically every national jurisdiction.[441] However, this new national space legislation on spaceports is attracting extensive attention to commercial spaceports, which will demonstrate their power in the future torrent of space commercialization.

II. The Spaceport as A Legal Term: A Comparison of Different National Regulations

The term "spaceport" is not yet defined by international law. In the Oxford English Dictionary, it is defined as "a base from which spacecraft are

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at: https://www.reactionengines.co.uk/.

[436] Newman, Christopher J., *The Draft UK Spaceflight Bill 2017: Bold Vision or Future Imperfect?* The Precis (XI) 2017, available at: http://nrl.northumbria.ac.uk/33822/1/dsb2016%20sure.pdf.

[437] Speech: Spaceport UK, available at: https://www.gov.uk/government/speeches/spaceport-uk.

[438] Agbonlahor, Winnie, *Six Sites Shortlisted for UK 'Spaceport',* 04 March 2015, available at: https://www.planningresource.co.uk/article/1336709/six-sites-shortlisted-uk-spaceport.

[439] McArdle, Helen, *UK Spaceport Competition Axed in Favour of Licensing Model,* 20 May, 2016, available at: http://www.heraldscotland.com/news/14506625.display/.

[440] 49 USC Chapter 701 as further implemented by 14 CFR Chapter III, § § 400 et seq, Part 420 and Part 433.

[441] Gerhard, Michael/Reutzel, Isabelle, *Law related to Space Transportation and Spaceports,* in: Jakhu, Ram/Dempsey, Paul (eds.), Routledge Handbook of Space Law, Routledge Taylor& Francis Group, London, New York, 2017, p. 282.

launched".[442] As the pioneer and leader in the construction and operation of commercial spaceports,[443] the U.S. doesn't use the wording "spaceport". In the U.S., launch facilities that serve commercial, non-governmental customers must be licensed by the Federal Aviation Administration (FAA). Its federal law uses the terms "launch sites" and "reentry sites" instead of the word "spaceports".[444] A "launch site" is defined as "the location on Earth from which a launch takes place and necessary facilities at that location". A "reentry site" is "the location on Earth where a reentry vehicle is intended to return". While the U.S. does not use the term spaceport, the FAA has recognized that launch and reentry sites are often referred to as spaceports.[445]

In the 2018 Space Industry Act, the term spaceport is defined as a site from which spacecraft or carrier aircraft are launched or (as the case may be) are to be launched, or a site at which controlled and planned landings of spacecraft take place or (as the case may be) are to take place.[446] A spaceport does not include an installation at sea that can be moved from place to place without major dismantling or modification.[447] This definition is no different to what has already been summarized - that a spaceport is a public gateway to space that typically provides launch and re-entry sites.[448]

III. The Authorization of Private Operating Spaceports

Under the 2018 Space Industry Act, a person must obtain a spaceport license to operate a spaceport in the United Kingdom.[449] The applicant must have taken all reasonable steps to ensure that risks to public safety arising from the operation of the spaceport are as low as reasonably practicable, and any prescribed criteria or requirements should be met.[450] A submission of the

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[442] Oxford Dictionary, "spaceport" online at: https://en.oxforddictionaries.com/definition/spaceport.
[443] Tkatchova, Stella, *Emerging Space Market,* Springer, Berlin, 2018, p. 125.
[444] See e.g., 49 U.S.C. § 70101 (2000).
[445] 2008 U.S. Commercial Space Transportation Developments and Concepts, available at: https://www.faa.gov/about/office_org/headquarters_offices/ast/media/Developments_Concepts_Feb_2008.pdf.
[446] Section 3 (2) of the 2018 UK Space Industry Act.
[447] Section 3(3) of the 2018 UK Space Industry Act.
[448] Mineiro, Michael C., *Law and Regulation Governing U.S. Commercial Spaceports: Licensing, Liability, and Legal Challenges,* Journal of Air Law & Commerce (73) 2008, p. 761.
[449] Section 3 of the 2018 Space Industry Act.
[450] Section 10 of the 2018 Space Industry Act.

assessment of environmental effects is requested of the spaceport applicant. The assessment should contain the effects on the environment of the launches occurring from the spaceport.[451] Safety and security in the operating of spaceports is also addressed by the 2018 Space Industry Act.[452] When a person is authorized by a spaceport license to operate a spaceport, bylaws regulating the use and operation of the spaceport, and the conduct of persons within it, should be made for the purposes of ensuring security in relation to the spaceport; spaceflight activities, and associated activities carried out at the spaceport; spacecraft and payloads at the spaceport.[453] The monitoring rights and the power to give directions or other administrative rights of authority are regulated in the Act when a breach of a spaceport license condition occurs.

IV. **Spaceports-the Future's Commercial Space Battlefield**

It is not the States' obligation to regulate spaceports in order to fulfill the requirements set forth by international space law. The international treaties applicable to space activities do not address spaceports specifically.[454] Moreover, looking at the spaceports all over the world, most of them are operated by governments or have major shareholders thereof. Therefore, the impetus for States to enact national regulations for spaceports is insufficient. However, with the continuous evolution of space commercialization, the government needs more private capital to operate spaceports in order to promote the development of space technology, as well as the national economy. Based on these domestic concerns, regulation regimes on spaceports are being proactively introduced.

Like the national legislation on sub-orbital activities, the regulation of spaceports is still in its early stage. It is expected that the growing participation of private spaceport operators in the space transportation field

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[451] Section 11 of the 2018 Space Industry Act.

[452] Sections 19 and 23 of the 2018 Space Industry Act.

[453] For more details, see section 24 of the 2018 Space Industry Act.

[454] Gerhard, Michael/Reutzel, Isabelle, *Law related to Space Transportation and Spaceports,* in: Jakhu, Ram/Dempsey, Paul (eds.), Routledge Handbook of Space Law, Routledge Taylor& Francis Group, London, New York, 2017, p. 282.

will lead to an enhanced need to regulate such activities.[455] The UK Space Industry Act will deliver the first-born spaceport for the UK. Due to the competition between the UK and the other European countries to become the hub for space launches resulting from the commercialization of space activities, there will be more national legislation on spaceports. With States gaining more and more experience, further national dispositions regulating spaceports will evolve and become mature, as has been the case for the regulation of private space activities.[456]

D. Chapter Conclusion

In this chapter, three new contents, which have been enrolled into national space legislation, have been discussed. The U.S. 2015 Space Act legislates on authorization for private exploitation and the appropriation of asteroid resources stemming from the lobbying efforts of big space companies at the domestic law level as there is no settled international regime for the exploration of outer space resources. The 2018 UK space legislation provides a clear legal framework for sub-orbital activities in the absence of international standards and regulations governing the private operation of spaceports, which are not specified by international law**.**

With the improvement of space technology, issues like space resource mining and sub-orbital tourism are most likely to happen in the foreseeable future; meanwhile, participants in these fields find that international space law provides no clear answer to these questions. As scholars concluded, "as is the case on many other issues where international law is not sufficiently elaborated, as soon as a practical need arises for certain States to deal in legal terms with an issue, attention automatically should be directed towards national legal actions and developments", [457] the new developments discussed above obviously are no exceptions. In this context, some point out that adopting national space legislation on what has not been solved by

[455] Ibid.
[456] Ibid.
[457] Von der Dunk, Frans, *Space for Tourism? Legal Aspects of Private Spaceflight for Tourist Purposes,* in: Proceedings of the 49th Colloquium on the Law of Outer Space, 2006, p. 21.

international space law is the best suited instrument to regulate and to control private space initiatives.[458] Consequently, these legislative practices have attracted widespread attention, provided reference models for other States and will also play a catalytic role in the field of new national space legislation and international discussion.

Although until now, China fails to adopt domestic space law merely on the basic contents of space activities, as a competitive space power, it is also necessary to consider how to specifically formulate provisions with respect to the newly developing space areas, which depend greatly on private participants.

[458] Linden, Dimitri, *The Impact of National Space Legislation on Private Space Undertakings: Regulatory Competition vs. Harmonization,* Journal of Science Policy & Governance (1) 2016, online at: www.sciencepolicyjournal.org.

Chapter IV. The Development of Space Policy and Activities, as well as the Status Quo of Space Law in China

The necessity of enacting national space legislation, the main content of the domestic space law, as well as new developments which have the potential to impact national space law-making were introduced and analyzed respectively in the previous three chapters. In this chapter, factors which directly relate to Chinese space law's creation will be concluded upon and analyzed. In doing so, three aspects are to be considered: (1) China's main space policies; (2) China's major government-oriented space programs and the newborn private space enterprises; and (3) the status quo of China's space legislation.

Essentially, China's space policies describe the fundamental principles and purposes for developing space activities, which provide a clear direction for making relevant laws and regulations. The development of space programs determines the basic framework and structure of Chinese space law, the rapid growth of private space programs makes it more explicit. Furthermore, the existing regulations constitute a basis for further legislation; law-makers may formulate new regulations to replace the existing ones or amend them by considering recent developments.

A. The Main Space Policies of China

A national space policy generally provides comprehensive guidance for national space activities involving national security and the civil and commercial space sectors. China's space policy has moved through different phases in response to the dramatic change in the Chinese economic situation and the dynamic international environment. Since the year 2000, the Chinese government has released the national space policy by way of white papers outlining the overall development policy every five years. Besides the white papers, in recent years, the emphasis on the policy of military-civil integration has made a great impact on the development of the privatization of Chinese space activities.

I. **Fundamental Space Policies of China: A Summary of the "White Papers"**

The "White Paper" of China's Space Activities published by the State Council Information Office, is commonly accepted as having outlined China's basic space policy.[459] In the year 2000, the first space white paper was published.[460] Thereafter, another three white papers have been published respectively in the years 2006,[461] 2011[462] and 2016.[463]

In addition to summarizing the development of the specific space fields in the past five years and presenting an outlook of space activities in the coming five years, the white papers explicitly explain the exact purposes, the basic principles and the measures China is undertaking in space activities.

1. The Purposes for Developing Space Activities

The purposes for developing China's space activities are defined in the 2016 White Paper as: "to explore outer space and enhance understanding of the earth and the cosmos; to utilize outer space for peaceful purposes, promote human civilization and social progress, and benefit the whole of mankind; to meet the demands of economic, scientific and technological development, national security and social progress; and to improve the scientific and cultural levels of the Chinese people, protect China's national rights and interests, and build up its overall strength."[464] It can be summarized that China develops its space capabilities with three major aspects of purpose. One is to better understand the earth and outer space, the second is to maintain

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[459] Several researchers believe that the "White Papers" are not qualified to act as the space policy of China and point out that "they (White Papers) are more like [a] work plan than [a] policy statement." There are also some inconsistencies and contradictions in China's space policy. See: Houpt, D. M., *"Does China Have a Comprehensive, Coordinated, and Consistent Space Policy? Implications for U.S. Policymakers",* UMI Number: 1491425, Washington D.C., 2011, pp. 1-64.

[460] The official English translation to the 2000 White Paper is available at: http://www.gov.cn/english/official/2005-07/27/content_17656.htm.

[461] The official English translation to the 2006 White Paper is available at: http://www.gov.cn/english/2006-10/12/content_410983.htm.

[462] The official English translation to the 2011 White Paper is available at: http://www.gov.cn/english/official/2011-12/29/content_2033200.htm.

[463] The latest one was formally published on 27th December 2016, and an official English translation is online at: http://www.scio.gov.cn/ztk/dtzt/34102/35723/35727/Document/1537101/1537101.htm.

[464] Part I of China' s Space Activities in 2016.

national security and protect national rights and interests, and the third is to develop the national economy.

The purpose of enhancing the understanding of the Earth and exploring the vast cosmos stems from the dreams of Chinese people flying to outer space which date back to ancient times. The stories of Cheng'e[465] and Wan Hu[466] are still rooted in the Chinese people's hearts and keep spreading widely. In modern life, a better understanding of the Earth and cosmos will largely expand people's knowledge and make social progress.

The purpose of maintaining national security and protecting national rights and interests is the starting point in developing space activities for many States. Although, nowadays is no longer reminiscent of the time during the Cold War when States developed space technology mainly for military uses, there are still unpredictable threats in today's uncertain global circumstances. For example, the rapid and widespread use of artificial satellites would pose threats to national cybersecurity while it has brought convenience and profits to human life. In another perspective, the increasing privatization of space activities also makes a difference to national rights and interests. It is impossible to rely on such profit-oriented private entities to safeguard national rights and interests. Furthermore, governments have often seen private activities as a distraction from their main goals, such as the exploration of space and publicly funded applications.[467] Therefore, building up space capabilities is an indispensable way for States to better safeguard national security, rights and interests.

What's more important, nowadays, which no one will deny, is the

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[465] Chang'e is the Chinese goddess of the Moon. She is the subject of several legends in Chinese mythology, most of which incorporate several of the following elements: Houyi the archer, a benevolent or malevolent emperor, an elixir of life and the Moon. (see: https://en.wikipedia.org/wiki/Chang%27e); The Chinese Lunar Exploration Program is titled as "Chang'e", for more details on the Chinese "Chang'e Program, please see the official website of China's Lunar and Deep Space Exploration, available at: http://www.clep.org.cn/.

[466] Wan Hu is a legendary Chinese official — supposedly from 2000 BC, or otherwise from the middle Ming dynasty (16th century) — who was described in 20th century sources as the world's first "astronaut" by being lifted by rockets into outer space. The crater, Wan-Hoo, on the far side of the Moon is named after him. For more information, please see: https://en.wikipedia.org/wiki/Wan_Hu.

[467] Johnson, Stephen B., *Space Business,* in: Eligar Sadeh (ed.), Space Politics and Policy: An Evolutionary Perspective, Kluwer Academic Publishers, Dordrecht, Boston, London, 2002, p. 241.

significance of space activities to the global economy. Space-related activities relate to challenging hi-tech efforts, but they also bring lucrative economic value. The global space market has been regarded as a seductive cake that every country wants to have a bite of. As discussed in the previous Chapters, the UK even wants to make its national economy more robust by developing its space industry. The Chinese government also perceives the space industry as an important part of the nation's overall strategy for the sake of meeting the demand for economic development.

2. The Principles for Developing Space Activities

China always adheres to the basic principles of independent development, innovative development, coordinated development, peaceful development and open development when engaging in space activities.[468] Over the past 60 years of remarkable development since its space industry was established in 1956, China has made great achievements, and it has opened up a path of self-reliance and independent innovation.[469] It has been concluded that independent space activities mark States as important international players and China has made that crucial step forward and is now moving on a path, the speed and content of which China determines, rather than looking to other States for implicit or explicit guidance.[470] Except for the independent development principle, other principles, i.e., innovative development, coordinated development, peaceful development and open development, are equally crucial for developing China's space activities.

Innovation is the soul of all technological developments. Space-based technology becomes an essential part of human beings' everyday life, and it is not an exaggeration to say that it is becoming a daily commodity. Space-related innovation will bring more benefits for the human being generally.

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[468] These principles are summarized from the 2016 White Paper, to respond to the development of space industry growth and international environment changes, basic principles for developing space programs were adjusted, for example, in the 2016 version, the "coordinated principle" is especially mentioned, but the "independence principle is no longer addressed specifically. However, principles which come from the main space treaties, *inter alia*, peaceful development, open (cooperation) development, are contained in all four white papers.

[469] For further detail on the 2016 White Paper, see the Preamble part.

[470] Handberg, Roger, *China's Space Strategy and Policy Evolution,* in: Eligar Sadeh (ed.), Space Strategy in the 21st Century, Routledge Taylor & Francis Group, London, New York, 2013, p. 249.

China takes independent innovation as the core of the development of its space industry.[471]

The coordinated development principle focuses on the management of space activities. To implement this principle, "China rationally allocates various resources, encourages and guides social forces to take an orderly part in space development. All space activities are coordinated under an overall plan of the state to promote the comprehensive development of space science, space technology and space applications, and to improve the quality and efficiency of overall space development."[472] In the 2016 white paper, for the first time, to encourage social forces to take an orderly part in space development was written into a national space policy, which means that private enterprises are no longer excluded from participating in space activities. Space development in China no longer only relies on the government's endeavor. This gives political back-up to the private sector when seeking an opportunity to do business in space.

Peaceful development has always been accepted by China as the basic principle in all related areas. There is no exception in developing space activities. The peaceful principle is also one of the most important international space law principles.[473] China, a responsible country as it claims, always adheres to the principle of the use of outer space for peaceful purposes and opposes the weaponization of or an arms race in outer space. It develops and utilizes space resources in a prudent manner.[474]

The year 2018 marks the fortieth anniversary of China's policy of reform and opening up.[475] "Opening leads to progress while closing only results in

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[471] Part I of the China' s Space Activities in 2016.

[472] Ibid.

[473] The Preamble of the 1967 Outer Space Treaty indicates that it is: "desiring to contribute to broad international cooperation in the scientific as well as the legal aspects of the exploration and use of outer space for peaceful purposes". For a more specific analysis of this principle, please see: Hobe, Stephan/Hedmann, Niklas, *Preamble of the Outer Space Treaty*, in: Hobe, Stephan/Schmidt-Tedd, Bernhard/Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume I, Carl Heymanns, Cologne, 2009, p. 22.

[474] Part I of China' s Space Activities in 2016.

[475] The year 2018 marks the 40th anniversary of China's Reform and Opening (gaige kaifang), initiated by Deng Xiaoping at the Third Plenum of the Eleventh Central Committee in 1978. For more details, please see: Oh, Seung-Youn, *China's Reform and Opening: 40 Years and Counting: How Far is the Chinese Government Willing to Go in Letting Go of Economic Control?* 1 June 2018, available at:

backwardness, China will not close its opened door, and the door will only be opened wider and wider."[476] In the fields related to space activities, China always persists with the open development policy. As addressed by the 2016 white paper, "opening to the outside world and international cooperation has being [sic] carried out in order to promote the mankind [sic] progress as a whole and ensure the long-term sustainable development."[477]

3. **The Measures for Developing Space Activities**

Specific measures for rationally arranging space activities, enhancing space innovation, transforming and upgrading the space industry's capacity, accelerating the satellite application, strengthening the legislative work, improving the diverse funding system, encouraging more people to work in the space industry and promoting international exchange and cooperation are particularly listed in the 2016 white paper as goals to fulfil the fundamental principles and achieve the purposes of developing space activities. Among all these measures, two are meaningful enough to be discussed in the present research.

(1) **Encouraging Private Capital and Cooperating with Private Investors**

Compared to former white papers, one special measure for China to continue its space activities development in the 2016 version is the "improvement of the diverse funding system". It is the first time that the Chinese government has encouraged private capital to be involved in space undertakings by writing it into the national space policy. On the one hand, "non-governmental capital and other social sectors are encouraged to participate in space-related activities, including scientific research and production, space infrastructure, space information products and services, and use of satellites to increase the

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https://thediplomat.com/2018/06/chinas-reform-and-opening-40-years-and-counting/; Liu, Xiaoming, *Forty Years of Achievements Spur Us on In the New Era,* 27 March 2018, available at: https://www.telegraph.co.uk/news/world/china-watch/society/40-years-of-chinese-reform/.

[476] Cf. The commitments made by the Chinese president Xi in the speech at the start of the Communist Party's twice-a-decade national congress at the Great Hall of the People in Beijing on 18th October 2017. More information is available at: http://www.scmp.com/news/china/policies-politics/article/2115951/xi-vows-wider-open-door-policy-amid-foreign-demands.

[477] Part I of China' s Space Activities in 2016.

level of commercialization of the space industry."[478] On the other hand, "the government is intending to increase its cooperation with private investors, and the mechanism for government procurement of astronautical products and services will be improved."[479] Bearing in mind the criticized feature of space activities as being military-dominated, this is great progress in the privatization process of China's space activities.

（2） International Cooperation

"International cooperation is currently the most likely way forward in many fields, particularly given the vast investment that space activities require."[480] The promotion of international cooperation has always been understood by the Chinese government as a fundamental principle in developing space activities. The means of space cooperation have been considered as having established the foundations for an expanding Chinese space program through alignment with other cooperative states.[481] In the first white paper, international cooperation is one part which is emphasized. In the 2011 white paper, cooperative space activities are discussed in a much more detailed way and are clearly laid out as the road map for the future.[482] Up to the 2016 white paper, China created a series of comprehensive ways of space cooperation, more specifically:

First, China supports various types of international cooperation in space fields, including multilateral cooperation under the framework of the United Nations, bilateral cooperation, as well as all inter-governmental and non-governmental space organizations' activities that promote the development of the space industry.

Second, China emphasizes utilizing the existing cooperative organizations as platforms to facilitate cooperation in space, for example, the

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[478] Part IV. 6 of China' s Space Activities in 2016.
[479] Ibid.
[480] Lyall, Francis/Larsen, Paul B., *Space Law: A Treatise,* Second Edition, Routledge: Taylor & Francis Group, London, New York, 2018, p. 512.
[481] Handberg, Roger, *China's Space Strategy and Policy Evolution,* in: Eligar Sadeh (ed.), Space Strategy in the 21st Century, Routledge Taylor& Francis Group, London, New York, 2013, p. 256.
[482] Ibid. p. 258.

Asia-Pacific Space Cooperation Organization, the BRICS cooperation mechanism and the Shanghai Cooperation Organization etc.

Third, in the 2016 white paper, the Belt&Road Initiative (B&R)[483] is especially mentioned, relevant multilateral and bilateral space cooperation programs are required to contribute to constructing the "B&R".

China encourages space participants to develop international space exchanges and cooperation in diverse forms and at various levels under the guidance of relevant state policies, laws and regulations. The scope of participants, which are encouraged to commence cooperation, covers scientific research institutes, industrial enterprises, institutions of higher learning and social organizations etc.

II. The Military-Civil Integration Policy: The Catalyst of Space Privatization in China

Civil-military integration (CMI) is concluded as the process of combining the defense and civilian industrial bases so that common technologies, manufacturing processes and equipment, personnel, and facilities can be used to meet both defense and commercial needs.[484] CMI has already been well practiced by many countries, some major military powers and technological giants who have been exploring the maximum benefits of the integration for decades.[485] In the context of the Chinese language, civil-military integration is referred to as military-civil integration. However, there are no essential differences in the meaning. Moreover, the wording military-civil integration indeed reflects that there are technologies, facilities, resources, etc. from the military being used in the civil context due to the current situation in China.

1. A Short History of the Military-Civil Integration in China

Early attempts of China's military-civil integration took place in the 1980s. During this period, military factories were converted to provide civilian

[483] The specialized official website of the B&R Initiative is available, the English version is available at: https://eng.yidaiyilu.gov.cn/.

[484] Bitzinger, Richard A., *Asia-Pacific Security Studies Civil-Military Integration and Chinese Military Modernization,* Asia-Pacific Center for Security Studies, Vol. 3, 2004 p. 1.

[485] Wang, Lei, *China Names Key Areas of Military-Civilian Integration,* 21 July 2017, available at: https://news.cgtn.com/news/3d41444d7751444e/share_p.html.

production.[486] After 1992, China started to establish a socialist market economy system and established the principle of military-civil integration as the goal of defense system innovation.[487] In 2009, promoting the development of military-civil integration, establishing and improving armaments research and production system, military personnel training systems, and military security systems based on civil-military integration, improving defense mobilization system, and continuing to break new ground for the development of civil-military integration were highly emphasized.[488]

Since 2012, China has achieved a revolutionary restructuring of military organization and services amid an in-depth reform of national defense and the armed forces.[489] Meanwhile, military-civil integration has gradually developed. In March 2015, the development of military-civil integration was brought to the level of China's national strategy.[490] In January 2017, the Central Commission for Integrated Military and Civilian Development was set up to lead efforts on the strategy, which has highlighted China's determination to boost innovation and economic growth by applying advanced military technologies in civilian fields.[491] In 2018, deeper military-civil integration was constantly emphasized. Implementing the strategy of military-civilian integration was taken as a prerequisite for building integrated national strategies and strategic capabilities and for realizing the goal of building a strong military in the new era.[492]

In order to correspond to the national strategy of military-civil integration, the Chinese government has launched a program for clearing up outdated

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[486] Chen, Bo/Liu, Qun, *Defense Innovation in China: History, Lessons, and Trends,* IGCC Defense Innovation Briefs (January) 2014, p. 3.

[487] Ibid.

[488] Chairman Hu Jintao stressed, during him presiding over the 15th Collective Learning of the Political Bureau of the Central Committee of the CPC, to Develop Civil-military Integration with Chinese Characteristics and Promote Positive Interaction between Defense Building and Economic Development, available at: http://news.cctv.com/china/20090724/108438.shtml,

[489] *Deepened Military-Civilian Integration Urged,* Xinhua, 13 March 2018, available at: http://www.china.org.cn/china/NPC_CPPCC_2018/2018-03/13/content_50702863.htm.

[490] See *The National Military-Civilian Integration Strategy,* available at: http://guoqing.china.com.cn/keywords/2017-06/20/content_41085116.htm,

[491] Wang, Lei, *China Speeds Up Civil-Military Integration to Boost Economy,* 25th January 2017, available at: https://news.cgtn.com/news/3d59444e79416a4d/share_p.html.

[492] *Deepened Military-Civilian Integration Urged,* Xinhua, March 13, 2018, available at: http://www.china.org.cn/china/NPC_CPPCC_2018/2018-03/13/content_50702863.htm.

regulations. The regulations adopted in the last 40 years in related fields are being examined. Such regulations create barriers to the two-way flow of technology, human resources, capital and information between the military and civilian sectors, as well as failing to give private enterprises equal treatment in market access and intellectual property protection, and other outdated regulations are to be revoked or modified.[493] This program will safeguard the development of military-civil integration and bring private entities more confidence to engage themselves in the industries.

2. **The Military-Civil Integration Policy and China's Space Privatization Development**

For a long time, the high-end space activities in China were exclusively controlled and dominated by the army and giant state-owned conglomerates, private participants were extremely limited.

The deeper military-civil integration policy brings two aspects of development opportunity for private enterprises' participation. Firstly, institutional obstacles are being removed to facilitate private enterprises' participation in space-related defense sectors. The space-related military industry has been a relatively closed field. Furthermore, the private sectors have long been excluded from it. There is no fair competition environment for the private sectors to get involved in. Through military-civil integration, market-oriented featured space-related fields will be much more open to the private sectors.

Secondly, technologies will be transferred from the military and defense industries to private companies, and those private companies will be listed as military suppliers. Over the years, China has put huge amounts of resources into the military industry and accumulated highly advanced technologies. Private enterprises are still in their initial stage, by contrast, military technologies are more advanced than civil technologies in many areas. The technology transfer will help private participants develop relatively easily and

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[493] *China to Clear Outdated Regulations on Military-Civilian Integration,* Xinhua Updated: 22nd February 2018, available at: http://www.chinadaily.com.cn/a/201802/22/WS5a8ed9f0a3106e7dcc13d6f6.html.

much faster. Also, at the same time, the procurement from the government will somehow guarantee the private enterprises operate in good condition.

B. The Space Activities of China: Focusing on Traditional State-Oriented Programs and Emerging Private Activities

China has obtained rather considerable achievements in developing space activities. Its governmental sponsored space programs cover nearly all space areas. In recent years, the significance of the private sector has been recognized and motivated by relevant policies, Chinese space privatization is currently progressing quickly.

I. State-Oriented Space Activities

1. A Short Review from the Historical Perspective

The beginning of Chinese space activities can be dated back to the 1950s. China established its first rocket missile research institute, the Fifth Institute of National Defense in 1956.[494] Thereafter, the State Council Scientific Planning Committee put satellite launching into the scientific development plan in 1958. In the same year, China made its firm intention to develop indigenous satellite launching capabilities on the 8th Chinese Communist Party's Second Plenum.[495] Soon after, China successfully launched its first liquid meteorological rocket, T-7, in September 1960.[496] Then, the Chinese Academy of Science set up the "Chinese Academy of Sciences 581 Group" and the Shanghai Electrical and Mechanical Design Institute, to carry out space physics research and sounding rocket development work.[497] Henceforth, the Chinese Academy of Science set up the Star Trek Committee,

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[494] With respect to the details of the establishment, history and other information pertaining to the Fifth Institute of National Defense P.R.C, please see: Mei, Shixiong/Mao, Jun, T*he first Institute of Missile and Rocket-the Fifth Institute of National Defense,* available at, http://www.mod.gov.cn/education/2017-07/
10/content_4785170.htm, the original language is in Chinese.

[495] See: Harvey, Brian, *China's Space Programme: From Conception to Manned Spaceflight,* Springer, Berlin, 2004, pp. 25–26.

[496] For more information, please see: http://history.eastday.com/h/20131022/u1a7727375.html, the original language is in Chinese.

[497] See: Lu, Shouguan, *The Birth of the First Chinese Artificial Satellite,* available at: http://www.nssc.cas.cn/xwzx/cmsm/kjkezl/201511/t20151105_4454387.html.

carried out space technology planning and academic activities, in order to proceed with the construction of a space environment simulation laboratory and the study of artificial satellite tracking measurement technology.[498]

In January 1965, the first session of the Third National People's Congress decided to set up the Seventh Ministry of Machinery Industry of the People's Republic of China based on the Fifth Institute of National Defense's unified management of rocket missile research, design, trial production and capital construction. In December of the same year, the Chinese Academy of Science set up a satellite design institute and began to design China's first man-made earth satellite program and develop related systems. Then, the China Space Technology Research Institute was established in 1968 to unify and organize satellite research, design, trial production, testing organizations, which were scattered in various departments. In May 1970, China Space Technology Research Institute was placed under the leadership of the Seventh Ministry of Machinery Industry.

Based on these complex efforts launched by various institutions, on 24th April 1970, China launched the first man-made earth satellite "Dongfanghong-I" and became the fifth State in the whole world, after the Soviet Union, the United States, France and Japan, to be able to launch an independent satellite.[499]

Over the past 60 years of remarkable development since it established its space industry, China has made great achievements in space activities. China opened up a path of self-reliance and independent innovation and has created the spirit of China's space industry.[500]

2. Prominent State-Oriented Space Programs

China's space program is distinguishable as it has a full range of capacities typically found only in the context of developed space actors.[501] These

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[498] Ibid.

[499] For more details regarding the Chinese first satellite, Dongfanghong-I, see: Liu, Debing, *An Introduction of the Dongfanghong-I Satellite by Applying relevant Data,* available at: http://history.people.com.cn/n1/2016/0429/c372326-28314808.html, the original language is Chinese.

[500] Ibid.

[501] Harding, Robert C., *Space Policy in Developing Countries: The Search for Security and Development on the Final Frontier,* Routledge, Taylor&Francis Group, London, New York, 2013, p. 86.

capacities shine through the fields of space launch vehicles, man-made satellites, manned spaceflights, deep space exploration and the creation of launch sites.

(1) Long- March Series of Space Launch Vehicles

The development of China's space launch vehicle commenced in October 1956. With long-term efforts and exploration, China's Long-March-I launch vehicle successfully launched China's first man-made satellites into orbit in 1970. This is an important milestone in China's space transportation system's development.[502] Thereafter, the Long-March Series of launch vehicles were developed. They are famous in the world for their ability to launch different types of satellites and manned spacecraft into low, medium and high Earth orbit and for their capability to conduct unmanned deep space detection and track entry accuracy, which have reached the advanced international level.[503]

Long-March launch vehicles have the low earth orbit (LEO) carrying capacity of up to 25 tons, a solar synchronous orbit (SSO) carrying capacity of up to 15 tons, the earth geostationary transfer orbit (GTO) carrying capacity of up to 14 tons.[504] They provided a broad stage for China's space technology, which has promoted the development of China's satellite and its application and manned space technology. They effectively supported China's major national projects like "manned spaceflight project", "Beidou navigation" and "lunar exploration project".

Up to April 2018, China's Long March series launch vehicles have flown 271 times, sending about 400 spacecrafts into orbit.[505] In the coming years,

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[502] For more information on the research, launching and other issues pertaining to the Long March-I launch vehicle, please see the introduction by the China Academy of Launch Vehicle Technology, available at: http://www.calt.com/n486/n536/c6451/content.html.

[503] Many documents can be found regarding the details of China's Long-March Series Vehicles, see: *Comprehensive Analysis of Chin's Long-March Series Vehicles,* available at: http://www.xinhuanet.com/tech/2016-06/22/c_1119094472.htm; see also: *An Introduction to the First Flight of Long-March V,* China Economic Weekly, (07 Nov.) 2016. (a comparison of the technical characteristics, data parameters and the first flight time of the whole Long-March Series launch vehicles is included in this thesis).

[504] On the new development of the Long-March Series' launch capacity, see: Par II.1, China's Space Activities in 2016, December 2016, available at: http://www.scio.gov.cn/ztk/dtzt/34102/35723/35727/Document/1537101/1537101.htm.

[505] Please find more specifics at: https://www.ithome.com/html/discovery/356732.htm, the original language is Chinese.

endeavors will be made to research crucial technologies and further study will be conducted on plans for developing heavy-lift launch vehicles.[506] When essential technical breakthroughs are made, the heavy-lift launch vehicle project will be activated.[507] Moreover, China will research the technologies for low-cost launch vehicles, new upper stage and the reusable space transportation system between the earth and low-earth orbit.[508]

(2) Beidou Navigation Satellite System

The number of China's satellites in-orbit has surpassed that of Russia, rendering it the second highest in the world after the USA.[509] China's satellite series can be divided into four main categories: earth observation satellites, communications and broadcasting satellites, navigation and positioning satellites, and new technological test satellites. The global satellite navigation system "Beidou Navigation Satellite System" (BDS) is one of the sophisticated global satellite navigation systems developed by China itself.[510] China plans to start providing basic services to support the establishment of the "Belt & Road", to form a network consisting of 35 satellites for global services by 2020, and provide all clients with more accurate and more reliable services through advancing ground-based and satellite-based augmentation systems in an integrated way.[511]

(3) Shenzhou Series Manned Spaceflights and Tiangong Space Station

The Chinese government approved the manned space flight project officially

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[506] Currently, Long March-V is the most important heavy lift launch vehicle in China, which achieves a carrying capacity of 25 ton in Lower Earth Orbit. However, the "Falcon Heavy," which was successfully launched and returned by the U.S. Space-X company in February 2018, is capable of lifting 63.8-ton payload into the LEO. When a comparison is made, it seems that China's heavy lift capacity needs further development to rank among the space-faring nations group. For more information on the Long March-V, see: http://www.calt.com/n482/n742/index.html, the original language is Chinese; Specifics of "Falcon Heavy" can be found at: http://http://www.spacex.com/falcon-heavy.

[507] See: Part II.1 of the China' s Space Activities in 2016.

[508] Ibid.

[509] For more specifics, see: Number of satellites in orbit by major country as of August 31, 2017, available at: https://www.statista.com/statistics/264472/number-of-satellites-in-orbit-by-operating-country/.

[510] All information with respect to the Beidou Satellite Navigation System can be found on its official website, http://www.beidou.gov.cn/, a general introduction to the system is available at: http://www.beidou.gov.cn/xt/xtjs/.

[511] Part III. 2 (3) of China' s Space Activities in 2016.

in 1992 and named it "921 Project".[512] A three-step development strategy was launched, the first step being: to launch manned spacecraft, build an initial supporting experimental manned spacecraft project, and carry out space application experiments; the second step being: after the success of the first manned spacecraft, to master the manned spacecraft rendezvous and docking technology, and to utilize manned spacecraft technology to modify and launch a space laboratory to solve a certain size, short-term care of the space application problem; the third step being: to construct a manned space station, to solve a large-scale, long-term care of the space application problem.[513]

On 20th November 1999, China's first unmanned spacecraft, "Shenzhou-I," took off from the Jiuquan Launch Site.[514] In the following three years, "Shenzhou-II", "Shenzhou-III", "Shenzhou-IV" were successively and successfully launched.[515]

15th October 2003 is a special day marking China's first manned space flight.[516] "Shenzhou-V" manned spacecraft was launched, Yang Liwei, one of the first generation of Chinese astronauts, became the first to be sent into outer space. This was a giant step as China became the third member of the manned spaceflight club after Russia and the United States of America.

Subsequently, "Shenzhou-VI" and "Shenzhou-VII" were launched and accomplished astronaut space extra-vehicular activities and a series of space science missions. China, thus, became the third State worldwide to master space extravehicular activities technology.[517] Starting from "Shenzhou-VII", China has stepped into the second period of a manned space project.[518]

In June 2012 and June 2013, the "Shenzhou-IX" and "Shenzhou-X"

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[512] All details regarding the manned space project of China can be found on the official website "China Manned Space", http://en.cmse.gov.cn/; an English version is available. An introduction to the history of development regarding China's Manned Space Project, as well as the "three-steps strategy," is available at: http://en.cmse.gov.cn/col/col69/index.html.

[513] Ibid.

[514] The full story of Shenzhou-1 can be found at: http://en.cmse.gov.cn/col/col975/index.html.

[515] An introduction to Shenzhou-2, 3, 4 can be found at: http://en.cmse.gov.cn/col/col976/index.html; http://en.cmse.gov.cn/col/col977/index.html; and http://en.cmse.gov.cn/col/col978/index.html.

[516] For more details, please see: http://en.cmse.gov.cn/col/col979/index.html.

[517] More information is available at: http://en.cmse.gov.cn/col/col980/index.html.

[518] Please find more specifics on Shenzhou-7 at: http://en.cmse.gov.cn/col/col981/index.html.

manned spacecraft were launched to dock with the target spacecraft "Tiangong-I".[519] In September and October 2016, the "Tiangong-II" space laboratory and "Shenzhou-XI" manned spacecraft were launched and formed an assembly that operates steadily, with the mission of carrying out science and technology experiments in space, indicating that China has mastered technologies concerning astronauts' mid-term stay in orbit, and long-term ground mission support.[520]

Shenzhou-XI's mission is the transition between the second step and the third step in China's manned space project's three steps: this being the preparation for the construction of China's manned space station.[521] It is also China's longest duration of a manned mission; the total flight time is up to 33 days.[522]

Currently, China has mastered manned space transportation, space extra-vehicular activity, space docking, operating in assembly and astronauts' mid-term stay in orbit,[523] and the key technologies for cargo transport and replenishment to accumulate experience in building and operating a space station.[524] China aims to complete the main research and development work on the space station modules, and start assembly and operation of the space station in the near future.

(4) Lunar and Mars Exploration Projects

Deep space exploration helps human beings to study the origin, evolution and current status of the solar system and the universe, understand the relationship between space phenomena and the natural system of the earth, and lay a foundation for mankind to open up a broader territory in the future. China's deep space exploration began with lunar exploration because the Moon is the closest planet to the earth. China's lunar exploration project is also called

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[519] An illustration of the Tiangong-1 project is available at: http://en.cmse.gov.cn/col/col986/index.html.

[520] For an introduction to Tiangong-2, please see: http://en.cmse.gov.cn/col/col101/index.html.

[521] Song, Jie, *The Missions and Technical Innovation of Shenzhou-11 Launch Vehicle,* available at: http://tech.sina.com.cn/d/s/2016-10-17/doc-ifxwvpar8218104.shtml, the original language is Chinese.

[522] Ibid.

[523] Part II-3 of China's Space Activities in 2016.

[524] Clark, Stephen, *China's Tianzhou 1 Supply Vehicle Re-enters Atmosphere,* available at: https://spaceflightnow.com/2017/09/22/chinas-tianzhou-1-supply-vehicle-re-enters-atmosphere/.

Chang'e Project, including three development phases. The first phase is Moon detection. In 2007, China launched its first lunar detector, Chang'e-I, conducting an overall survey of the Moon. In December 2012, Chang'e-II's lunar probe made a successful observation trip over asteroid 4179 (Toutatis).[525] In 2013, the Chang'e-III achieved the first soft landing on the surface of an extraterrestrial body and completed patrol and exploration on the surface of the Moon,[526] which accomplished the second phase, making China the third country in the world to master lunar exploration technology. In November 2014, China achieved success in the re-entry and return flight test of the third phase of lunar exploration engineering. These achievements indicate that China has mastered the key technology of spacecraft re-entry and return flight in a speed close to second cosmic velocity.[527] China successfully launched the Chang'e-IV and achieved the first soft landing on the far side of the Moon in the whole world in January 2019 in order to facilitate a better understanding of the formation and evolution of it.[528] China also expects to launch a detector and bring back lunar samples.[529] It has been anticipated that China's plan for lunar exploration will be further progressed to achieve the target of sending men to the Moon in around 2030.

In addition to the lunar exploration project, China also focuses on Mars exploration, as a part of the deep space exploration program. In July 2017, China built the first Mars Stimulation Base in the Qinghai province to support the scientific research of exploring Mars.[530]

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[525] Part II-4, ibid.

[526] Ibid.

[527] Ibid. For more information on the Chinese lunar program, please see the official website of China Lunar and Deep Space Exploration at: http://www.clep.org.cn/, a general introduction to China's Lunar Exploration Program is available at: http://www.clep.org.cn/n487137/index.html, the original language is Chinese, no English translation is available.

[528] Lunsford, Christine, *Photos from the Moon's Far Side! China's Chang'e 4 Lunar Landing in Pictures,* see: https://www.space.com/42887-china-moon-far-side-landing-photos-chang-e-4.html.

[529] *China to launch Chang'e-5 lunar probe in 2019,* (24 April) 2018, China Daily, online at: http://www.chinadaily.com.cn/a/201804/24/WS5adf3e0da3105cdcf651a3f6.html.

[530] See more details on the official website regarding China Lunar and Deep Space Exploration, available at: http://www.clep.org.cn/n5982019/c6797369/content.html, the original language is Chinese.

(5) Space Launch Sites

A space launch site (spaceport) is concerned to be the most significant infrastructure for engaging in space activities. More and more States are focusing on encouraging private entities to build spaceports in order to provide commercial launching services. Details have been discussed in Chapter III of the present research. Until now, China has constructed four space launch sites, which are respectively located at Jiuquan, Xichang, Taiyuan and Wenchang.[531]

As the first Chinese launch site, the Jiuquan Satellite Launch Center was established in 1958, so far more than 50 satellites have been launched from this site. The Taiyuan Satellite Launch Center was constructed in 1967, most meteorological satellites, resources satellites, as well as telecommunication satellites, are launched from it. The satellite launch center in Xichang is the only launch site in China, which is in charge of launching geostationary orbit satellites, moreover, Xichang center is also the first Chinese launch site open to foreign users. The Wenchang Launch Site is the newest in China. It was basically completed in December 2014, its first launch was held in June 2016, this launch marking a new generation launch site designed and built by China.[532] The successful construction and operation of the four launch sites in China have satisfied the launch needs of manned spaceships, space laboratory core modules, deep space probes and all kinds of satellites.

For a long time, space activities have mainly been controlled and operated by governmental authorities or state-owned companies. Due to a strong consideration for national security, non-governmental enterprises have nearly no opportunities to participate in space undertakings. Even if several regulations are enacted to manage civil space programs, no relevant private corporations are created. Until the year 2015, after the "Military-Civil Integration" strategy was proposed, several non-governmental space/space-related companies appeared. As the 2016 white paper confirmed the basic

[531] For more details on Chinese launch sites, please see: *Four Launch Sites of China,* available at: http://
www.kankanews.com/a/2016-06-23/0037576146.shtml, the original language is Chinese.
[532] Ibid.

principle of "coordinated development" to encourage social forces' involvement in space activities, more private participants will emerge in the future. The following section will introduce the emerging private space corporations and summarize the fundamental characteristics of them.

II. Emerging Private Space Activities in China

U.S. researchers observe that in the year 1997, for the first time, private sector space revenues exceeded governmental space expenditures, and the number of commercial payloads launched into space exceeded the number of government payloads.[533] However, for a long time, there were no private entities in China to start a business directly related to space services (e.g. launch services etc.). The involvement of private corporations in space areas was always limited to simple purchasing activities. For instance, as early as the 1980s, a Chinese private owned corporation bought a Hong Kong satellite, which was launched by Russia for communication business.[534] Thereafter, several Chinese universities launched their own satellites by way of the Long March series but a real private space activity was not apparent until the year 2015.

1. Chinese Private Space Corporations: An Overview

The space environment is no longer the sole preserve of government agencies. Private companies have entered the exploration domain and are propelling the sector forward more vigorously and swiftly than would be the case if left to governments alone.[535]

As a matter of fact, the involvement of private enterprises in space activities can be generally divided into "indirect involvement" and "direct

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[533] Federal Aviation Administration, Associate Administrator for Commercial Space Transportation, "Commercial Space Transportation: 1997 Year in Review", (Janurary 1998.), see also: Vedda, James A., *Space Commerce,* in: Eligar Sadeh (ed.), Space Politics and Policy: An Evolutionary Perspective, Kluwer Academic Publishers, Dordrecht, Boston, London, 2002, p. 215.

[534] Liu, Xiaohong, *Considerations of Chinese Space Commercialization and Normalization,* Aerospace China (4) 2001, p. 13.

[535] Grady, Monica, *Private Companies are Launching a New Space Race-Here's What to Expect,* 3 October, 2017, available at: https://theconversation.com/private-companies-are-launching-a-new-space ce-race-heres-what-to-expect-80697.

involvement". [536] Indirect involvement includes involvement such as participating in insurance and financing businesses;[537] or situations in which private businesses purchase the products of space activities performed by States or State institutions.[538] When private enterprises directly participate in activities such as space telecommunication, remote sensing, navigation, satellite launching, even the newly emerging space tourism services, these activities can regarded as the "direct involvement" of private entities in space activities. [539] Whether direct private participation or indirect private participation, such participation of private entities in space activities is already a widespread and increasingly developed phenomenon in other space-faring States. However, in China, private participation in outer space activities is currently seeing its dawn.

In China, for a very long time, there were no private entities directly doing business related to space activities. Indirect private participation is also extremely limited. However, the situation changed around 2015 when China's policy started to encourage the participation of private entities in space activities, especially after military-civil integration became the national strategy. In addition to private capital's participation in state-owned companies, purely privately funded companies became particularly eye-catching and they soon sprung up like mushrooms.

In the light of the inspiration stemming from the encouraging policy, many private commercial aerospace companies started to pursue their career in space-related fields. Start-ups like Commsat[540] and Spacety[541] are well-known as they engage in the satellite R&D and the satellite launching fields. Others, like LinkSpace,[542] OneSpace[543] LandSpace[544] and Space Honor

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[536] Hanneke, Louise/Van Engelman, Traa, *Commercial Utilization of Outer Space: Legal Aspects,* Drukkerij Haveka B.V., Alblasserdam, 1989, pp. 203-204.
[537] Ibid., p. 204.
[538] Ibid.
[539] Ibid.
[540] The Commsat has mastered the overall design, and other core technologies of small satellites, please find more details on their official website: http://www.commsat.cn/#introduction.
[541] More information is available at: http://en.spacety.com/en_company.htm.
[542] The official website of the LinkSpace company is available at: http://www.linkspace.com.cn/.
[543] The official website of the OneSpace company is available at: http://www.onespacechina.com/.
[544] Land Space was founded in 2015 and engaged in the development and operation of rockets in China.

(iSpace),[545] focus on the rocket R&D, manufacturing and launching services. Some companies have already made progress and achieved good results.

Spacety, which specializes in developing commercial micro/nano-satellites, aiming to provide short-cycle, low-cost and one-stop services to scientists, research institutes, and commercial companies for science experiments and technology demonstrations, has already put 4 satellites into outer space and plans to launch another 18 satellites in 2018.[546]

LinkSpace, the first private-owned company, was established in Beijing in the year 2014.[547] The final objective of the company is to break through the government's monopoly of the space market.[548] Their current business mainly covers the overall design of the spacecraft, liquid engine, solid engine, structural design, avionics, and TT&C system.[549] In July 2016, the company achieved rocket hover flight with a single vector-thrust engine for the first time in China. In February 2018, the FMN-1, China's first individually funded satellite, which was designed and made by Link-Space, was launched. The FMN-1 is the world's first panoramic satellite equipped with a 4K HD panoramic camera that can show 360-degree high definition photos of space.[550] This satellite has attracted much attention not only because it is the first privately owned satellite, but also because the owner is Chinese real estate tycoon, Feng Lun.[551] People then started to speculate that there will be

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It focuses on the small and medium-sized commercial aerospace application market and is committed to the development of liquid fuel rocket engines and commercial launch vehicles with independent intellectual property rights. More information is available at: http://www.landspace.com/ /site/about.

[545] Space Honor is committed to developing outstanding commercial launch vehicles and providing systematic launching solutions to provide more efficient, better and more cost-effective launching services to commercial space customers around the world so as to greatly enhance the human freedom to enter space, more information is available at: http://en.i-space.com.cn/.

[546] More details can be found at: http://digitalpaper.stdaily.com/http_www.kjrb.com/kjrb/html/2018-01 /30/content_387610.htm?div=-1, the original language is Chinese.

[547] For more details, see: http://www.linkspace.com.cn/.

[548] The first Rocket Company was Established in China by the generation after the 90s, available at: http://news.k8008.com/html/201407/news_16780185_1.html.

[549] See: http://www.linkspace.com.cn/.

[550] Zhao, Lei, *Miniaturized Satellite's Launch Marks Milestone,* China Daily (9 February) 2018, available at: http://europe.chinadaily.com.cn/epaper/2018-02/09/content_35673530.htm, see also the official website of the LinkSpace company at: http://www.linkspace.com.cn/.

[551] For more information on Feng Lun and his company, please see: http://www.vantone.net/en/content s/377/1448.html.

more tycoons in the real estate area, or with regard to hi-tech conglomerates, turning their attention to private commercial space activities. Furthermore, the company has recently laid out its own project of a reusable space launch system, which brought about the expectation that it could only be a matter of a few years until Space-X's monopoly in this field is broken up.[552]

Another private space company, OneSpace focuses on the development of intelligent small-scale launch vehicles. It aims to provide cost-effective launch services for commercial micro-satellites around the world and is committed to exploring the use of new technologies and mechanisms in the field of commercial aerospace with a determination to contribute to the world's commercial space industry as a Chinese power.[553] On 16th May 2018, OneSpace achieved China's first private rocket launch,[554] which introduced a new page to the development of China's privatization of space activities.

2. Main Characteristics of China's Development in Private Space Activities

At present, Chinese space companies rely much more on the technology transferred from the government under the private-favored policies. Self-developed technologies by these private corporations are rare. To become well developed in space technologies absolutely demands enough time, but one problem which must be resolved is that the current technology transfer is being progressed on the basis of governmental decisions and policies. In order to realize the national strategy of MCI, central and local governments are motivated to provide favorable conditions to private space enterprises. This is quite effective in motivating related companies to obtain a satisfactory achievement soon. For instance, only about two years after its creation, the OneSpace company successfully launched its first sub-orbital vehicle. This result is inspiring, but how to ensure the stable development of a company like OneSpace could prove to be a difficulty. Nevertheless, the government's

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[552] Nowakowski, Tomasz, *In the Footsteps of SpaceX—a Chinese Company Eyes Development of a Reusable Launch Vehicle,* 18 September 2017, available at: https://phys.org/news/2017-09-footstep s-spacexa-chinese-company-eyes.html.

[553] More information is available at: http://www.onespacechina.com/.

[554] See: https://thewire.in/space/private-cos-are-catalysing-chinas-rise-as-a-space-superpower.

technology transfer is only necessary at the first step, in the context of the MCI strategy, private companies' technical innovation contributing to public affairs (especially the military) is the ultimate target. In line with this view, appropriate legal measures, which are qualified to provide a stable environment for private entities' development and innovation, are required.

In addition to those apparent features of China's private space companies, positive facets, which have the potential to impact privatization future development, can also be observed. First, although in the initial development phase, China's private space activities constitute a comprehensive model: more specifically, private actors involved in a series of space business, for example, *inter alia,* launch services, satellite services and telecommunications etc. This will be quite beneficial to ensure the integrated development of the Chinese space industry. Second, the government is no longer the only customer of the newly established private space companies. Many others show their interest in space applications. The boss of a Chinese real-estate company bought the first Chinese private satellite, which is a good example. In other words, space applications are increasingly attractive to ordinary customers who want to achieve their commercial purposes.

In summary, in contrast with the rather developed government-dominated space programs, Chinese private activities seem like the tiny weak flame. However, national strategy, space policy and even the commercial environment have provided excellent opportunities for non-governmental space companies to grow. Meanwhile, appropriate space law and regulations have become necessities to ensure the stable and sustainable legal environment to respond to these new developments.

C. The Status Quo of Space Law in China

Compared with China's world-famous space programs, China's space legislation is disproportionally underdeveloped. The call for the establishment of comprehensive legislation on space activities emerged as early as the 1990s, but until now, this has not yet taken shape.

I. Two Measures as the Implementation of Treaty Obligations

China ratified four main international space treaties in the 1980s and enacted two administrative measures in the fulfilment of its international obligations.

1. The Legal Status of International Treaties in China's Domestic law

There is no general provision on the status of international treaties in China's legal system. In legal practice, it is generally accepted that treaties concluded between governmental departments should not contravene higher-level laws, and treaties concluded between governments or States should not contravene the Constitution or basic laws, unless the legislature has made appropriate amendments to the Constitution or the relevant laws.[555]

The Chinese Constitution and basic laws stipulate neither that treaties are automatically incorporated into domestic law, nor that treaties shall be transformed into internal legislation before they are applicable domestically. However, in practice, treaties with substantive obligations usually require special internal legislation to be transformed at domestic law and applied indirectly. When the pertinent subject matter is not covered by pre-existing domestic laws, treaty obligations will be transformed by special national legislation. Otherwise, treaty obligations will be transformed through amendments to existing laws.[556]

Some treaties require governmental action to promote cooperation with foreign States in a certain field, and they tend to be very general in their terms. Particularly when they generally do not directly concern individual rights, and treaties seldom give rise to legal disputes in domestic law; the implementation of treaty obligations will be carried out by way of administrative measures.[557]

2. China's Implementation of Space Treaty Obligations

After adopted the open policy and following economic reforms, China ratified the Outer Space Treaty at the end of 1983, followed by the Rescue Agreement, the Registration Convention and the Liability Convention at the end of 1988.

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[555] Wang, Tieya, *Introduction to International Law,* Beijing University Press, Beijing, 1998, p. 209.
[556] Xue, Hanqin and Jin, Qian, *International Treaties in the Chinese Domestic Legal System,* Chinese Journal of International Law (2) 2009, p. 302.
[557] Ibid., at p. 306.

However, China's space programs have military-domain characteristics intrinsically, and private participation has long been forbidden. In addition, as has been introduced, when treaties do not directly concern individual rights, at least when the legislators consider this to be the case, administrative measures are formed in order to implement treaty obligations. Consequently, China adopted two documents at the beginning of the twenty-first century to meet the international space treaties' requirements. One is the "Measures for the Administration of Registration of Space Objects" (2001), the other is the "Interim Measures on the Administration of Permits for Civil Space Launch Projects" (2002). In the following, these two measures will be summarized initially, thereafter, commentaries will be made in the light of the current development of space activities in China.

II. **Measures for the Administration of the Registration of Space Objects (2001)**

The Measures for the Administration of Space Objects' Registration ("Registration Measures") was released by the Commission for Science, Technology, and Industry for National Defense (CSTIND) and the Ministry of Foreign Affairs (MOFA) of China in 2001 to "strengthen the management of space affairs by [the] State, protect China's legal rights when she acts as a launching State, and…meanwhile to implement the obligations of the "Registration Convention" of which China is a member State".[558]

The measures apply to the "space objects that are launched in Chinese territory or beyond the borders when China acts as a joint launching State."[559] The entities which are responsible for registration include government departments, legal persons, other organizations and natural persons[560] when they act as the owner of space objects or the main owner when more than one

[558] Art. 1, "Measures for the Administration of Registration of Space Objects", 8 February 2001. See also: Nie, Mingyan, *Legal Framework and Basis for the Establishment of Space Cooperation in Asia,* Lit Verlag, Muenster, p. 75.

[559] Art. 3, ibid. The definition of "Launching State" is demonstrated here, "Launching State" means a State which launches or procures the launching of a space object; as well as a State from whose territory or facility a space object is launched. The definition here in Chinese law is completely the same as the one regulated in Art. I of the REG.

[560] Art. 4, ibid. See also, Nie, Mingyan, *Legal Framework and Basis for the Establishment of Space Cooperation in Asia,* Lit Verlag, Muenster, p. 75.

exists."[561] When the owner of a space object is a foreign government, legal person, organization or natural person, registration should be done by the companies who provide the commercial launching services.[562] Applying this provision to Chinese commercial launch activities, the Chinese commercial launch company should register a satellite launched by it from a domestic launching site, but owned by a foreign state or company.[563] Moreover, when China is a "Joint Launching State", the registration State should be determined by the MOFA in accordance with the regulations in the REG.[564]

In the 2001 Registration Measures, the definition of "Launching State" was directly quoted from the OST and REG.[565] Instead of clarifying the specific definition, the 2001 Registration Measures only provides for the general scope of the space object. The term "Space Object" used in the 2001 Registration Measures includes: "artificial satellites, crewed spacecraft, space explorers, space stations, the launching vehicles and parts thereof and other man-made objects launched into outer space."[566] It should be pointed out, particularly, that sounding rockets and ballistic missiles that cross outer space temporarily are excluded from the concept of space objects.[567]

According to the REG, the content of the national registry is free to be determined by the State of the registry concerned.[568] With regard to the 2001 Registration Measures, the information which has to be registered includes: the registration number, the registrant, the owner of the space object, the name and basic characters of the space object, the name of the launch vehicle, the date of the launch, the name of the launch site, the basic orbital parameters and the status of the launching and orbiting of the space object etc.[569] The

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[561] Art. 7. With regard to Art. 8, the Owner in this provision only refers to the Chinese ones.

[562] Art. 8, ibid.

[563] Ling, Yan, *Comments on the Chinese Space Regulations,* Chinese Journal of International Law (7) 2008, p. 687.

[564] Art. 14, "Measures for the Administration of Registration of Space Objects", 8 February 2001.

[565] Art. 3, ibid.

[566] Art. 2, ibid. See also: Ling, Yan, *Comments on the Chinese Space Regulations,* Chinese Journal of International Law (7) 2008, p. 686.

[567] Ibid.

[568] Art. III (3) of the Registration Convention.

[569] Art. 6, Measures for the Administration of Registration of Space Objects. See also: Wang, Guoyu, *China's Space Regulations: Regulation and Licensing,* 53rd Session, Legal Sub-Committee, UNCOPUOS, Vienna, March 2014.

information that is required to be transmitted to the UN is the same as the information stated in the REG.[570] Generally speaking, the specific content of the national registry in China is more comprehensive than which must be transmitted to the UN.

Because there are time limits to national and international registrations in the context of the REG, disputes may arise between States as to whether a launching State has fulfilled its obligation of registering a space object in a timely manner.[571] The 2001 Registration Measures sets time limitations for both national registration and international registration. The former shall be completed within 60 days after the space object has entered orbit. The latter shall be made to the Secretariat of the UN by the Chinese MOFA within 60 days of the national registration of the space object.[572]

III. Interim Measures on the Administration of Permits for Civil Space Launch Projects (2002)

The 2002 Interim Measures on the Administration of Permits for Civil Space Launch Projects (hereinafter referred as "Launch Permits Measures") are formulated with a view to regulating the administration of "civil space launch projects".[573] Moreover, the "civil space launch projects" in the "Launch Permits Measures" refer to the entry of such spacecraft as satellites from inside the territory of China into outer space for non-military purposes, and the entry of such spacecraft as satellites, etc. over which natural persons, legal persons or other organizations of the P.R.C have had property or have property by means of in-orbit delivery into outer space from outside of the territory of China.[574]

According to the 2002 "Launch Permits Measures", the general project contractor shall be the applicant of the permit. If there is no domestic general project contractor, the final owner of the satellite or other spacecraft shall be

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[570] Art. IV (1) of the Registration Convention.

[571] Ling, Yan, *Comments on the Chinese Space Regulations,* Chinese Journal of International Law (7) 2008, p. 686.

[572] Art. 9 and Art. 12, Measures for the Administration of Registration of Space Objects, 2001.

[573] Art. 1, Interim Measures on the Administration of Permits for Civil Space Launch Projects 2002.

[574] Art. 2, ibid. See also: Nie, Mingyan, *Legal Framework and Basis for the Establishment of Space Cooperation in Asia,* Lit Verlag, Muenster, p. 76.

the applicant of the permit.[575] The applicant should meet several conditions[576] and submit the required documents to the CSTIND 9 months before the prearranged month of the launch of the project.[577] The documents which should be submitted include "materials on how to avoid pollution and space debris, and on other relevant safety".[578] What's noteworthy is that the permit holder is responsible for purchasing third party liability insurance and other relevant insurance policies for launching the space object.[579] In other words, the purchasing of insurance is not a precondition to obtain the permit. It is required after obtaining the permit.

For a foreign-related project, the "Launch Permits Measures" are very strict. First, the relevant matters of a foreign-related project must be organized by a foreign trading company designated by the Chinese government, and the contract of such a project shall not become effective until it is approved by the CSTIND.[580] Second, in the process of document submission, the materials on policy evaluation, confidentiality and safety evaluation must also be submitted by the applicant.[581] Finally, for a project in the stage of a foreign executive launch site, the permit holder shall, 60 days before the prearranged day of the launch, file an application to the CSTIND for approval of the project to leave the factory, and attach copies of the effective final documents (three copies) legally binding in respect of the third party liability insurance, the relevant insurance policies, security, confidentiality, etc., and shall not continue carrying out the project before it is approved.[582]

IV. Comments on the 2001 and 2002 Measures

China's domestic space legislation obviously lags much compared with other

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[575] Art. 5, ibid.

[576] The conditions include for example: the project under application shall not endanger state security, damage the benefits of the state, violate the state's diplomatic policies or the international conventions which have been concluded and become effective; the project under application will not cause irremediable danger to the health, safety or properties of the public due to major negligence or intentional acts. Art. 5 (b) (c), ibid.

[577] Art. 6, ibid.

[578] Art. 6 (d), ibid.

[579] Art. 19, ibid.

[580] Art. 9, ibid.

[581] Art. 6, ibid.

[582] Art. 21, ibid.

space-faring countries. In the time in which there was no private participation in China's space activities, it would be far-fetched to assert that the measures were satisfactory as they at least help to fulfil international obligations. However, the obvious drawbacks become opaque when private companies are surging forward.

From the legal perspective, in China, administrative licenses shall only be laid down by laws and administrative regulations.[583] The launch permit is one type of administrative license; however, it is in the form of an administrative measure belonging to departmental rules.[584] This situation is not only illegal but also causes contradictions when the application relates to other domestic regulations.

As for the substantive content perspective, essential regulations pertaining to private participation are absent, especially indemnification rules, and the recourse ceiling provisions.[585] It is hard to convince private companies to proactively participate in space commercial activities. Furthermore, these two measures, which focus merely on licensing and registration, are too narrow to match the status of space activities which act as an important part of China's overall development strategy.

V. The Progress of the Enactment of China's Space Legislation

To enact national space legislation is not a fresh topic in China. As early as 1993, with the decades-long development of China's space industry, appeals for national space legislation to govern national space activities already emerged. Shanghai delegates to the National People's Congress proposed that national space law needs to be enacted. Since then, space law experts, senior officials of the national administrations and other prominent people have been urging the Chinese government to put in place national space legislation.[586]

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[583] Art. 12, the Law on Administrative Licensing and Decision on Reservation of Certain Administrative Approvals, No. 412 Order of State Council, 29 June 2004.

[584] Please find more specifics on the tier hierarchy of national legislation in China in Chapter V-A of the present thesis.

[585] More details are presented in Chapter II of the present research; further analysis is also shown in Chapter V.

[586] Ling, Yan, *Comments on the Chinese Space Regulations,* Chinese Journal of International Law (7) 2008, pp. 681–689.

These efforts finally resulted in the successive promulgation of two sets of Chinese space regulations, the 2001 Registration Measures and the 2002 Launch Permits Measures.

Reportedly, in the late 1990s, the adoption of a comprehensive space administrative regulation was once among CSTIND's highest priorities. A special task force was set up to study the related issues that finalized the space regulation draft. However, the CSTIND was integrated into the newly established Ministry of Industry and Information Technology as a subordinate agency and renamed the State Administration of Science and Technology and Industry for National Defense (SASTIND) in 2008. This merger cost CSTIND the independent power of formulating administrative regulations and ten years of legislation efforts were to no avail.[587]

The changes in attitude towards space legislation are also reflected in the white papers on China's space activities. Three white papers mentioned space legislation. The 2006 version listed the necessary specific measures "to strengthen legislation work; to formulate laws, regulations for guiding and regulating space activities, to increase the level of administration by law, and to create a legislative environment favorable for the development of space activities".[588] The 2011 version specifically pointed out that it would strive to "actively carry out research on national space law, gradually formulate and improve related laws, regulations guiding and regulating space activities."[589] This white paper is the first official document specifically listing the plan to develop national space legislation, which definitely has an impact on space legislative work.[590]

In October 2013, the Standing Committee of the National People's Congress of China indicated that space legislation is not fully equipped for legislative conditions and the need to continue to study and demonstrate.[591]

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[587] Wu, Xiaodan, *China's space law: Rushing to the finish line of its marathon,* Space Policy (46) 2018, p. 41.

[588] Part IV of China's Space Activities in 2006.

[589] Part IV of China's Space Activities in 2011.

[590] Zhao, Yun, *National Space Law in China: An Overview of the Current Situation and Outlook for the Future,* Brill, Nijhoff, Leiden, 2015, p. 12.

[591] *Legislative Planning of the 12th National People's Congress Standing Committee,* see: http://www.npc.gov.cn/npc/xinwen/syxw/2013-10/31/content_1812101.htm.

In 2014, national space legislation was taken as a "research item" shown in the State Council's "Legislative Work Plan."[592] Thereafter, space law was brought into the same item of the annually published legislative plan until 2016, the first year of China's "13th Five-Year Plan" (from 2016 to 2020).[593] In the same year, the 2016 white paper on space activities was promulgated. It for the first time proposed to accelerate the formation of a legal system centering on the enactment of national law to govern the space industry.[594] Except for having national law as its center, the space legal system also includes regulations on space data and their application management, the management of the export of astronautic products and technologies, the regulations on permits for space launch projects, the registration of space-related items, and permits for scientific and technological research and production.[595]

According to the Standing Committee of the National People's Congress' legislative schedule, China intends to complete its space legislation before 2020. However, until recently, not even a draft has been released.

D. Chapter Conclusion

With regard to China's space policies, space activities are the fundamental factors directly related to China's space law-making. The status quo of China's space law shows its obvious deficiencies.

China has promulgated four versions of white papers announcing its space policies publicly, with a disclosure of the purposes, principles and fundamental measures for developing space activities. These outstanding government-oriented space programs have already proven their determination for developing the space science and technology expressed in those white papers; however, the development of private space activities was almost

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[592] More specifics regarding the China State Council's Legislative Plan of 2014 can be found at: http://www.jl.gov.cn/zw/xxgk/jlgb/test2014zb_39290/201408/201408GBF/201405/t20140509_2271553.html.

[593] For more details on China's 13th Five Year Plan, see the official English translation titled "The 13th Five-Year Plan for Economic and Social Development of the People's Republic of China (2016-2020)" by the Compilation and Translation Bureau, Central Committee of the Communist Party of China, online at: http://en.ndrc.gov.cn/newsrelease/201612/P020161207645765233498.pdf.

[594] Part IV (5) of China's Space Activities in 2016.

[595] Ibid.

ignored. Thanks to the promotion of the Military-Civil Integration policy strongly supported by President Xi, the spring is coming for private space participation. Due to the encouragement from the 2016 white paper, several private space companies have successfully made their names heard.

In contrast to those on space science and technology, the efforts spent on national space legislation is obviously inadequate despite China gradually pushing forward in these policies. The existence of two Measures is more like a display, which for a long time has shown the fulfilment of the international obligation. The newborn private space-related companies necessitate the enactment of space legislation. Only a stable, sustainable and predictable legal environment will bring forward private companies.

Fortunately, the 2016 White Paper particularly and for the first time had the insight to present establishing a space legal framework to manage space activities, indicating the basic form of China's future space legislation. The existing two Measures, even if they have shortcomings, will still be the script of future regulations. Although the draft legislation has not yet been released, it is firmly believed that it will be shortly. For this research, the major aspects of China's future space legislation will be proposed in the following Chapter.

Chapter V. The Legal System of Chinese Space Legislation: Proposals on the Major Aspects of the Central Space Law and Administrative Regulations

How could China's space legislation look? This is a pivotal question to be answered for the purpose of this research. The international treaties and other relevant documents, the legislative practices of other States, the developments of regulating new space areas by domestic law etc. all have provided ideas that China could/should consider when drafting its own law. Meanwhile, space policy and other associated policy, the situation of space programs, as well as the existing legal measures on the space activities of China are influential for domestic space legislation. This chapter intends to describe the main aspects of future space legislation in China by comprehensively analyzing all major issues, which will contribute to creating national space legislation.

A. China's Space Legal System: An Overview of its Components and Creation

As the latest space policy in China, the 2016 white paper has outlined the skeleton of China's legal system clearly, i.e. taking national space law as the center, working with at least other five regulations, namely the regulations on space data and their application management, the management of the export of astronautical products and technologies, permits for space launch projects, the registration of space-related items, and permits for scientific and technological research and production respectively.

In the following discussion, the relationship between the central Space Law and the implementing regulations in the context of China's entire legal system, as well as the departments that are qualified to draft these documents, are to be considered by citing the provisions of Law of Legislation in China.

I. Space Law as the Core of China's Space Legislation System

1. Why Should it be Established in the Form of "Law"?

In China, the hierarchy of regulations is as follows: (1) the Constitution; (2) Laws enacted by the National People's Congress and its Standing Committee; (3) Administrative Regulations formulated by the State Council; (4) Local Regulations made by the local people's congresses and their standing committees at the provincial level; (5) Rules, including Departmental Rules by central-level ministries, commissions, and agencies directly under the State Council and Government Rules made by local governments of provinces.[596]

The Constitution has the highest legal authority as the fundamental law, no other forms of regulations may contravene the Constitution.[597] Law under the Constitution has higher legal authority than administrative regulations, local regulations and rules.[598] Administrative regulations have higher legal authority than local regulations and rules.[599] At the moment, those measures governing space activities in China discussed in the fourth chapter belong to the departmental rules; thus, the regulating regime in the space field is at a relatively low level.[600]

In China, major issues must be governed by law[601] according to the Constitution and the Law of Legislation. Space development has been seen

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[596] This is a conclusion drawn by the Legislation Law of China, Artt. 87-95.
[597] Art. 78, Legislation Law of China.
[598] Art. 88, ibid.
[599] Ibid.
[600] For more information, please see: Zhao, Yun, *National Space Law in China: An Overview of the Current Situation and Outlook for the Future,* Brill, Nijhoff, Leiden, 2015, p. 24.
[601] According to Art. 8 of the Legislation Law, in China, specific categories of matters shall only be governed by law. Specifically, those matters include: (1) matters concerning state sovereignty; (2) the formation, organization, and functions and powers of the people's congresses, the people's governments, the people's courts, and the people's procuratorates at all levels; (3) the regional ethnic autonomy system, the special administrative region system, the self-government system of people at the grassroots level; (4) criminal offences and penalties; (5) compulsory measures and penalties involving deprivation of a citizen's political rights or restriction of personal freedom; (6) the establishment of any category of tax, determination of tax rates, tax collection administration, and other basic taxation rules; (7) expropriation and requisition of property not owned by the state; (8) the basic system of civil matters; (9) basic economic rules and basic rules on treasury, customs, finance, and foreign trade; (10) Litigation and arbitration systems; (11) other matters which must be governed by laws developed by the National People's Congress and its Standing Committee.

as a necessary move for China to enhance national strength and has been leveled as one crucial part of China's overall national development strategy. Space activities involve various important fields, such as the economy, military, national security, etc. Hence, it is imperative to enact "law" as the form for governing space activities.

2. Who is Qualified and How to Make Law in China?

The National People's Congress and its Standing Committee exercise the law-making power in China.[602] The National People's Congress enacts and amends criminal, civil, and State organic laws and other basic laws. The Standing Committee of the National People's Congress enacts and amends all laws other than those to be enacted by the National People's Congress.[603] Thus, national space law should be enacted by the NPC Standing Committee. In the context of the NPC Standing Committee legislative procedures, a legislative bill can be introduced to the NPC Standing Committee by the State Council, the Central Military Committee, the Supreme People's Court, the Supreme People's Procuratorate or the various special committees of the Standing Committee.[604] The State Council is the most relevant to space activities; thus, a bill on space law shall be introduced to the NPC Standing Committee by the State Council. A bill which has been put on the agenda of the Standing Committee's session shall, in general, be deliberated three times[605] in the current session of the Standing Committee before being voted on.[606] Opinions from various methods, such as panel discussions, feasibility study meetings, hearings, should be heard, comments from relevant agencies,

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602 Art. 7, Legislation Law of China.

603 Ibid.

604 Art. 26, ibid.

605 Art. 29, ibid. "During the first deliberation of the bill at the current Standing Committee session, the bill sponsor shall brief the plenary session, whereupon preliminary deliberation shall be conducted by divided group sessions. During the second deliberation of the bill at the current Standing Committee session, the Legislative Committee shall brief the plenary session on the status of amendment and major issues in respect of the draft law, whereupon further deliberation shall be conducted by divided group sessions. During the third deliberation of the bill at the current Standing Committee session, the Legislative Committee shall give a report to the plenary session on the result of the deliberation on the draft law, whereupon deliberation on the amended draft law shall be conducted by divided group sessions. In the course of deliberation, if necessary, the Standing Committee may convene a joint group session or a plenary session to discuss the major issues of the draft law."

606 Art. 29, ibid.

organizations and experts should also be compiled in the course of deliberation.[607] Eventually, a national law passed by the NPC Standing Committee shall be promulgated by way of a presidential order signed by the State president.[608]

II. Administrative Regulations Stipulating Specific Space-Related Activities

1. Administrative Regulations as an Implemented Means

Specific space-related activities shall be governed by administrative regulations as implemented means of national space law in China. On the one hand, these administrative regulations have a relatively higher possibility of legal enforcement, which creates a stable legal environment. On the other hand, compared with the law, administrative regulations have a certain degree of flexibility and can be supplemented when necessary. Moreover, in addition to the five regulations listed in the white paper, when there are new space activities that need to be regulated, new administrative regulations can be introduced. In this way, China's space legal system can be continuously improved.

2. Who Makes the Administrative Regulations?

In China, the State Council enacts administrative regulations in accordance with the Constitution and national law.[609] The administrative regulations shall be drafted by the relevant department of the State Council or the Legislative Affairs Office of the State Council.[610] Under the State Council, the State Administration for Science, Technology and Industry for National Defense (SASTIND)[611] is the main administrative department of China's

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[607] Art. 36, ibid.

[608] Art. 44, Legislation Law of China.

[609] Art. 65 of the Legislation Law of China stipulates that, administrative regulations may provide for the following: (1) matters for which enactment of administrative regulations is required in order to implement a national law; (2) matters subject to the administrative regulation of the State Council under Article 89 of the Constitution.

[610] Art. 67, ibid.

[611] The SASTIND is a regulatory and policy-making body that oversees the work and personnel management of China's defense industry. SASTIND was created in 2008 out of the former Commission on Science, Technology and Industry for National Defense (CSTIND). Whereas CSTIND was a ministry-level organization, SASTIND was placed under the Ministry of Industry and Information

space industry. It is the successor of the Commission on Science, Technology, and Industry for National Defense (CSTIND) which enacted[612] the 2001 Measures for the Administration of Space Objects Registration and the 2002 Interim Measures on the Administration of Permits for Civil Space Launch Projects.[613] SASTIND shall take the leading role in the drafting of space administrative regulations. When necessary, other departments, such as the State Council Legal Affairs Office, the Ministry of Foreign Affairs, etc., shall work together with SASTIND in the process of space regulation drafting. In the process of drafting the administrative regulations, opinions of the relevant agencies, organizations, representatives of the people's congresses and the general public should be widely heard. Listening to opinions can take various forms, such as seminars, arguments, and hearings.[614] Lastly, an administrative regulation shall be promulgated by way of a State Council order signed by the premier.[615]

In brief, it is predicted that the central Space Law of the Chinese space legal system will be put high up in the hierarchy of the entire Chinese law system. A "law" drafted and enacted by the Standing Committee NPS is an option. The space law should be formulated as such so as to be qualified to provide fundamental legal directions to the operations of Chinese space programs, thereby, the content such as fundamental legal principles, basic measures etc., is regarded as being necessary to be encompassed by the space law. Comparing to the central space law, administrative regulations are drafted and adopted by the State Council. They belong to a lower hierarchy

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Technology and is thus of lower bureaucratic rank than COSTIND. Although the China National Space Agency is often called "China's NASA", it appears that SASTIND oversees the work of the space industry. See: Pollpeter, Kevin/Anderson, Eric/Wilson, Jordan/Yang, Fan, *China Dream, Space Dream: China's Progress in Space Technologies and Implications for the United States,* A Report Prepared for the U.S.-China Economic and Security Review Commission, IGCC, at p. 98. See also: Krolikowski, Alanna, *Inputs into China's Space Programs: Vision, Policy, and Organization, Testimony before the U.S.-China Economic and Security Review Commission Hearing on "China's Space and Counterspace Programs",* 18 February 2015.

612 Art. 80, Legislation Law of China, the various ministries and commissions of China may enact administrative rules within the scope of its authority in accordance with national law, administrative regulations, as well as decisions and orders of the State Council.

613 As has been concluded, regardless of their detailed regulations, these two measures should be elevated to a higher level, i.e. they should be administrative regulations.

614 Art. 67, Legislation Law of China.

615 Art. 70, ibid.

in China's legal system and should be created in accordance with the basic principles and measures stipulated by the central space law. Also, regulations focus much more on specific issues of space activities. As listed by the 2016 white paper, at the present stage, regulations regarding satellite data dissemination, aeronautics products export control, launch permits authorization, as well as space objects registration, need to be enacted. It is conceivable that more regulations will be required as the development of space commercial activities progresses.

B. A Proposal for Major Content of Chinese Central Space Law

There are more than 20 States that have enacted national space laws or regulations. Remarkable diversity exists among them in the scope, extent and approach due to various reasons, for instance, the specific needs and practical considerations and especially their different space activity priorities. In China, the 2016 White Paper has made it clear that specific regulations on launch activities, registration and other specific space-related activities will not be included in China's space law. Thus, one can imagine that China's space law will play a leading role in China's space legal system in the "law" form. It will exist as general law, establishing basic principles with which all space activities shall comply. Furthermore, this law will work as the fundamental law, including legal provisions on the common issues of all space activities, while specific issues still need to be regulated by specific regulations.

In the following, the basic framework of future Chinese space law will be outlined initially. Then, the main section that it is believed will be contained in China's future space law will be particularly discussed; namely, the principles for developing space activities and several articles will be proposed. Definitively, China's space law will contain more aspects and provisions, the present part of this research only concerns the most significant.

I. A General Framework for the Chinese Central Space Law

It is necessary for the central space law of China to contain the following parts, which constitute a basic framework of the law.

First, it is necessary for Chinese space law to contain general provisions

regarding the purposes for enacting the Space Law. A "purposes" section is always indispensable in law. Reviewing the practices of space law enacted by other States, the "purposes" provisions are formulated differently as the laws are made for different functions. For Chinese Space Law, it will be enacted as a basic law, the purposes provisions should concern much more the general administrative and coordinated aspects. For example, to establish the law to protect national security when involved in space activities; to administrate space activities to ensure well-organized development; to implement international obligations, etc.[616] In virtue of the law regulating space activities, the objectives of developing space activities would also be acceptable in the "purposes" provisions, and the relevant expression in the 2016 white paper can be applied here.[617]

Second, the fundamental principles that should be observed when carrying out space activities in the context of the space law should be included hereunder. The "principles" provisions are considered to be a crucial component of this law. Further analysis will be made in the next section of this research.

Third, the concrete obligations of the central and local government in implementing the basic principles of space law should also be contained hereunder. It is an idea learned from the 2008 Japanese Basic Space Law. With respect to China, obligation provisions for governmental departments are certainly required. For a long time, space policy has acted as the main instrument for administrating space activities; governmental departments are the bodies that implement these policies. Policies are always seen with the characteristic of "flexibility", which leaves much discretionary space for governmental departments. Also, previous space policies always emphasized the State developing space activities as a whole; paying less attention to the private sector. Thereby, in the space law enacted in the future, it is necessary to particularly underline the obligation for the government departments to

[616] A similar statement can be found in Wang, Jilian, *Accelerating Space Legislation, Building Space Power,* Space International (5) 2018, pp. 33-37.

[617] For example, the provision could be created as follows: "Space activities shall be carried out to explore and use outer space, enhance understanding of outer space and the Earth; improve the scientific and cultural qualities of the Chinese people, promote social progress and human civilization."

fulfil the basic principles.

Fourth, basic measures for implementing the fundamental principles must also be included. Principles are usually presented in very general terms in such law, this will also leave much space for self-determination by the executors. Therefore, basic measures, which can possibly provide clearer directions, are needed. Chinese law-makers should create such measures in space law after comprehensively considering all related issues of China's space affairs. In the next part of the present research, several basic measures will be mentioned when describing the fundamental principles.

The aforementioned four aspects are unable to formulate a comprehensive framework of China's central space law but are essential and necessary to be included.

II. Fundamental Principles of the Chinese Central Space Law

On the basis of the introduction and analysis of the previous chapters of this research, the following legal principles are recommended to be accepted in the Chinese central space law. These are namely: the peaceful exploration and utilization of outer space; preserving the environment when developing space activities; the innovative development of space activities; the coordinated development of space activities; promoting private participation in commercial space activities and encouraging cooperation in space affairs.

1. Peaceful Exploration and Utilization of Outer Space

The peaceful principle is one of the most important principles laid down by the international space treaties, which must be implemented. To explore and utilize outer space for peaceful purposes is the basis of all of the other principles, so this principle should be especially emphasized. However, a concrete definition for "peaceful purposes" has not been clearly described so far. Disputes as to the understanding of this term as meaning "non-military" or "non-weaponization" are still remaining.[618] Moreover, it is anticipated that

[618] For more details, see: Hobe, Stephan/Hedmann, Niklas, *Preamble of the Outer Space Treaty*, in: Hobe, Stephan/Schmidt-Tedd, Bernhard/ Schrogl, Kai-Uwe (eds.), Cologne Commentary on Space Law, Volume I, Carl Heymanns, Cologne 2009, p. 22.

a consensus will be difficult to achieve in the near future. Nevertheless, this principle is still indispensable in China's central space law. States are free to interpret this term from their own perspectives if fully respecting international law.

According to China's 2016 space policy, the term is explained further as avoiding a space arms race and weaponization, this understanding is in accordance with China's general assertion at the Conference on Disarmament.[619] A clause for the peaceful principle is proposed as follows:

Principle 1: Peaceful Exploration and Utilization

Space activities on the exploration and utilization of outer space shall be carried out in a peaceful manner; the weaponization of outer space and an arms race in outer space shall be guarded against.

2. Space Environment Preservation

To avoid potential environmental contamination from space activities is an obligation regulated by the 1967 Outer Space Treaty. Furthermore, the provision in the 1967 OST concerns both the earth's and the outer space environment. The increasing quantity of space debris has caused growing concern in the international community and at a domestic level. From the perspective of domestic law, mitigating space debris is commonly accepted as a precondition for authorizing private space activities.[620] Moreover, many States have taken measures specifically focusing on avoiding the creation of space debris.

With respect to China, the government published a document entitled "Space Industry Standards of P.R.C-Space Debris Mitigation Requirements" in April 2005. Furthermore, in December 2009, the CNSA published "Interim Measures for Space Debris Mitigation and Protection Management" to deal with the space debris issue.[621] This "Interim Measures" regarding space

[619] For accomplishing this target of preventing a space race and banning space weapons, China and Russia have submitted a treaty draft entitled "Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects" to the Conference of Disarmament for further discussions. For the full text of this draft treaty, see: http://www.mfa.gov.cn/chn//gxh/zlb/zcwj/t406998.htm.

[620] More specifics can be found in Chapter II of this research, also see part C of the present Chapter.

[621] For more information, please see: A/AC.105/C.1/2016/CRP.13, China's Position Paper on the

debris mitigation are similar to the "Measures (Interim Measures) of space launch permits and registration, but the 2016 white paper does not recommend creating a regulation for administrating space debris. Therefore, it is predicted that the recently formulated Chinese space legal system will not encompass such a regulation, but the central space law is obliged to accept a related basic principle. On the one hand, it is a requirement of international treaties and documents, on the other hand, to confirm such a principle in the central space law would create a legal basis for making specific regulation in the future. The provision regarding environmental preservation is proposed to be worded as follows:

Principle 2: Space Environment Preservation

Space activities under the jurisdiction of China shall take full consideration on protecting the space environment.

3. Innovative Development of Space Activities

Without innovation, there will be no future for one State which wants to pursue the space dream. China has achieved being a space-faring nation which has some innovative technologies controlled by the State. The State shall take measures to enhance space technology innovation and define the functional orientation of various innovative entities. Furthermore, under the policy of encouraging private participation and military-civil integration, the State shall take measures to ensure the transfer of space technology to private entities when private participation is in its initial stage. However, in the long run, private entities should be a major force supporting the State's space development. Thus, the State should take measures to encourage private innovation, for example, rewarding private space innovation etc.

With respect to the primary measures to provide motives for innovation, the government should improve mechanisms for personnel training, evaluation, mobility, and incentives; strengthen the ranks of strategic scientists, leading scientists and technicians, entrepreneurial professionals

Issues of Long-term Sustainability of Outer Space Activities, Committee on the Peaceful Uses of Outer Space Scientific and Technical Subcommittee Fifty-third session Vienna, 15-26 February 2016.

and highly skilled personnel.[622] Moreover, the government should also take measures to promote space science education, especially with regard to young people, in order to attract more people to engage in space activities and sustain space innovation.[623]

A clause on the innovative development of space activities should be drafted as follows:

Principle 3: Innovative Development of Space Activities

Independent innovation shall be taken as the core of the development of the space industry. The principle of innovation shall be implemented in space programs, scientific research and technological development.

4. Coordinated Development of Space Activities

When it refers to the coordination principle in space affairs, the following main aspects should be considered in conjunction with the special situation pertaining to the space development of China.

First, as different activities involved in the field of outer space are very complex, coordination should be strengthened among various space activities in consideration of comprehensive and smooth space development. Among all of the activities, the State shall take measures to deploy various resources scientifically: for example, prioritizing construction and the application of space infrastructure, actively supporting space exploration and space scientific research, continuing to enhance access to and use of space capabilities, and continuously enhancing space security protection capabilities, etc. These are all detailed measures listed in the 2016 White Paper which require incorporation into the central space law in the "Basic Measures" part.

Second, a specific space activity often involves the management of multiple administrative departments in China, for instance, the SASTIND, the CNSA, the General Armaments Department (GAD) of the People's Liberation Army (PLA), the MOFA, etc. Thus, coordination among different administrative departments also plays quite an important role in the effective

[622] For more specifics on this principle, please see: Part I-3 of the 2016 White Paper.
[623] Part IV-7, 8 of the 2016 White Paper.

development of space activities, especially when a private operator needs to obtain space-related authorizations from the government. What is worth noting is that China's administrative services are recently being reformed, more convenience will be provided for to enterprises and citizens, "one-stop services" are under construction.[624] Thus, coordination among these space-related administrative departments will bring more efficiency to space development.

Third, there is also a need for coordination between the central government and local governments. Since the introduction of the private encouragement policy, some local governments have taken measures to promote the policy. One prominent example is OneSpace. It has gained investment from the Chongqing Liangjiang Aviation Industry Investment Group in their manufacturing facility and was paid for China's first private rocket launch by way of the local government's support.[625] The practice in Chongqing shows that the local government has begun to interact with national space policy. However, this interaction should not only be in the form of just one case. Only by other local governments also reacting, can sustainable development be guaranteed. However, due to the instability of policies, the effectiveness of the local implementation of national policies will be greatly reduced. Local governments' interaction with the policies can only be well-developed through the presence of law.

An article on coordinated development in space activities as one legal principle of the space law can be written as follows:

Principle 4: Coordinated Development in Space Activities

The State shall rationally allocate various resources and coordinate all space activities under an overall plan. Related governmental departments shall clarify powers and responsibilities in administrating space activities. Central and local governments shall maintain efficient communication for

[624] *Reform of Government Services to be Directed by Plan,* 22 June 2018, available at: http://english.gov.cn/policies/latest_releases/2018/06/22/content_281476194828208.htm.
[625] For more specifics, please see: http://www.liangjiang.gov.cn/Content/2018-05/18/content_430215.htm (Chinese version), and: http://money.cnn.com/2018/05/16/technology/onespace-china-spacex-startup/index.html (English version).

serving space development.

5. Promotion of Private Participation in Space Activities

To encourage civil forces to be involved in space activities is an idea shown in the coordinated requirement of the 2016 white paper.[626] Also, the MCI strategy proposed by President Xi Jinping implies the aspiration for China to encourage the private sector to be involved in military-related fields;[627] the aerospace industry is also covered by this strategy.

In Chapter IV, the implications of the MCI strategy on non-governmental space development was illustrated.[628] It was observed that this strategy has motivated the private sectors to invest in space programs. However, valid rules should be confirmed in the space law provisions to provide a stable legal environment for ensuring the sustainable involvement of private persons in space fields. Therefore, promoting private participation in space activities is necessary and should be especially established as a legal principle of the central space law of China.

When it refers to the basic measures for implementing this principle, Japanese law has established several provisions, which can be taken as references.[629] Moreover, clauses could also be formulated on the specific regulation of space activities, for example, the regulation of launch permits' authorization.

As a legal principle in the space law of China, a provision could be formulated as:

Principle 5: Promotion of Private Participation in Space Activities

Qualified non-governmental entities are encouraged to participate in

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626 Part I-3 of the 2016 White Paper.
627 See, for a specific analysis of the MCI strategy, Chapter IV-A-II.
628 Ibid.
629 For example, Art. 16, entitled "promotion of space development and use by private business operators", of the BSL obliges the state to take the following measures for supporting private space business: (1) considering the procurement of goods and services systematically in conducting its own space development and use, using the capacity of private operators; (2) improving the launching sites, experiments and research facilities as well as other facilities and installations; (3) promoting the transfer of results of the research and development with regard to space development and use to private business operators; (4) promoting the privatization of results of research and development with regard to space development and use in the private sector; and (5) taking taxational and financial measures and other necessary measures to facilitate investment by private operators in the space development and use business.

space activities, promotion and guidance measures shall be made or improved to ensure participation.

6. Promotion of International Cooperation

The 1967 OST indicates no specific meaning of the basic legal principle concerning international cooperation. Generally, scientific and legal cooperation in space is encouraged by the OST. In practice, cooperation in space activities is carried out in various forms: for example, to develop complex cooperation in the framework of an inter-governmental organization (e.g., ESA and APSCO), to cooperate establishing a large-scale space program (e.g., the International Space Station), to develop commercial space projects together (e.g., Chinese-Brazilian cooperation in a series of commercial space programs) etc. As an emerging space power, China is active in nearly all types of international space cooperation.

The provision on international cooperation in space as one principle in the space law could be formulated as follows:

Principle 6: Promotion of International Cooperation

All kinds of cooperation beneficial to space development in China are encouraged. Specific rules shall be created to support the broad involvement of cooperation activities in space by both governmental and non-governmental sectors.

In brief, the central space law of China is perceived to be formulated as a basic legal document to ascertain the essential directions of China in developing space activities. The general purposes, fundamental principles and basic measures etc., created by the space law are not only meaningful to space actors for adjusting their activities but are also helpful to drafters of the law to formulate the implementing regulations.

C. Regulations for Implementing the Central Space Law

China's central space law, formulated as the core of the Chinese space legal system, provides the basic principles and measures for conducting space activities while administrative regulations in essence contain much more detailed applicable regulations for specific matters. In the following part, the

main concerns and aspects of the relevant regulations will be emphasized.

I. Regulation on Permits for Space Launch Projects

1. Motivations for Establishing Regulation on Launch Permit in China

(1) Fulfillment of the International Obligation

Art. VI OST imposes an international obligation on States and stipulates that States shall authorize and continuously supervise activities of non-governmental entities. As has been analyzed in the first chapter of the present research, it is the starting point for States to enact national space legislation. Thus, in order to fulfill the authorization obligation, regulations on permits for space launch projects in China are essential.

(2) "Launch" as the Major Activity in the Space Field

The space Launch is the basis for almost all of the other space activities. In China, the building of the navigation system, the mission of manned spaceflights, the construction of a space station, and deep space exploration, etc. all rely on the activities of the space launch. From the perspective of private participation, commercial interests are also present in providing launch services. With the rising of private participation, especially, under the MCI policy, private launch activities will proliferate constantly, authorization of space launch activities will then be an urgent demand.

(3) The Principles from the Central Space Law Requesting Launch Permit Regulation

As has been introduced with respect to the formulation of China's central Space Law, promotion of privatization and space environmental protection are important basic principles. These principles need to be realized in the specific regulations. Take launch permit regulation as an example, in order to implement the basic principles; space environmental protection can be listed as one authorization condition, the duration of an application procedure can be regulated relatively shortly for the sake of promoting privatization by way of an efficiency guarantee.

(4) The Policy in the White Paper Needs to be Implemented

The 2016 White Paper calls for the improvement of China's 2002 Launch Permits Measures. As a departmental rule, it is no longer qualified to meet the demands of China's space development. Thus, the 2002 Launch Permits Measures should be upgraded to an administrative regulation instead of a departmental rule formally and should include provisions which can satisfy the new development of China's space launch field, while the basic provisions can be used as the basis of the new regulation.

It is necessary to point out that several of the motivations (e.g. implementing international obligations, fulfilling the legal principles established by the space law and meeting space policy's needs) described above regarding the creation of space launch permit regulation are also applicable to other regulations' establishment, no specific analysis will be made in the following parts when discussing the other regulations.

2. **Main Content of Launch Permit Regulation and Recommendations**

Despite the 2002 Launch Permits Measures not having a visionary consideration of private participation, the provisions on the conditions of authorization, continuing supervision and administration (enforcement/sanction), in-orbit transfer of space object ownership, the authorization requirement of which, for instance, nearly parallels all of the related items summarized by international initiatives, i.e., the ILA Model Law and the NatLeg Resolution, demonstrating that the substantive contents of the 2002 measures are still workable. Among these, the provisions related to authorization are desirable to discuss in detail from the perspective of promoting China's space privatization.

(1) Authorization Department

As has been introduced above, the SASTIND is the main administrative department of China's space industry. In the field of space launch activities, the SASTIND applies uniform planning and administration to civil space launch projects and is responsible for examining, approving and supervising civil space launch projects.[630] The SASTIND has direct contact with the

[630] Art. 4 of the Interim Measures on the Administration of Permits for Civil Space Launch Projects

space launch projects' applicants, and it is the drafting body for administrative regulations. Thus, suggestions from private participants could probably be reflected in future regulations.

(2) The Authorization Process

On 10th January 2018, the SASTIND released an Application Guide for the civil space launch projects application online. Issues on the scope of the application, the basis for authorization, the acceptance and decision agencies, application conditions, application materials, basic process, examination and approval results, result delivery, applicant rights and obligations, consultation, supervision and complaint channels, public inquiry and other detailed information are provided.[631] This application guide was created based on the 2002 Measures. It constitutes clear directions for private applicants, who want to apply for a space launch permit. The basic process is briefly summarized in the following chart：

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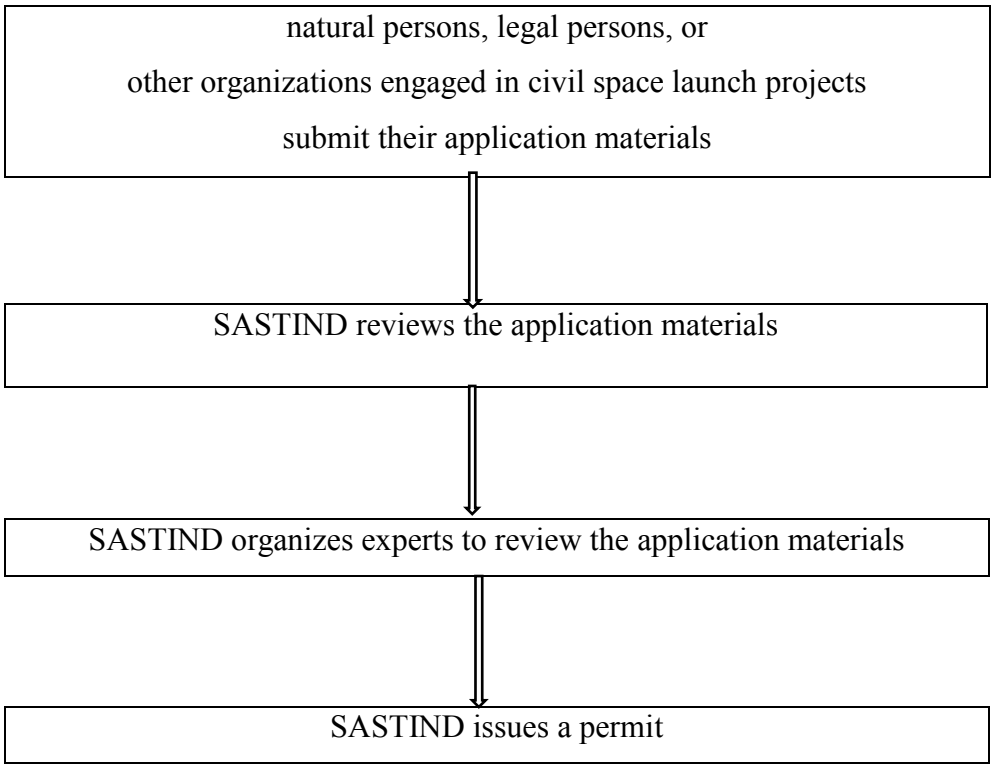

(China, P.R), 2002.

[631] More information about how to apply for a permit is available at：http://www.sastind.gov.cn/n6195634/n6195706/n6195716/n6427833/c6428394/content.html#lc.

The SASTIND first conducts a review on the "form" of the application materials, making sure that the documents, which have been requested are all included. Then, the SASTIND organizes experts to conduct a review on the "substance" of the application materials, deciding whether to issue a permit or not.

The duration of the review and issue of a permit shall be limited to thirty days, calculated from the day of the receipt of the application materials.[632] This duration can be seen as relatively high in terms of its efficiency. However, after an administrative decision has been made, the result will be notified to the applicant within ten working days.[633] Ten working days in order to deliver a result is too much long and needs to be shortened in the future in the interests of efficiency.

(3) Conditions of Authorization

In order to be a qualified applicant, several conditions must be met. Eligible financial capacity; solid technical knowledge; meeting the demands of public health, national security and foreign policy interests; compliance with international obligations, which has been summarized in the second chapter of the present research, are all conditions for applying for a space launch permit in China.[634]

The applicant shall, nine months prior to the scheduled launch of the project, submit the required documents (with three copies) to the SASTIND.[635] For the sake of promoting privatization, nine months could be

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[632] Art. 7 of the Interim Measures on the Administration of Permits for Civil Space Launch Projects (China, P.R), 2002.

[633] See: http://www.sastind.gov.cn/n6195634/n6195706/n6195716/n6427833/c6428394/content.html #lc.

[634] Art. 5 of the Interim Measures on the Administration of Permits for Civil Space Launch Projects (China, P.R), 2002.

[635] According to the 2002 Measures, materials that should be submitted in applying for a launch permit include: (a) an application form for a project license and documents on the qualifications of the applicant for evaluation; (b) the relevant documents proving that the project conforms to national laws and regulations on environmental protection; (c) for a project being executed in a domestic launching site, the following information shall be provided: the scheduled time of launch; the technical requirements for the satellite; the launching vehicle and the communication system for launch, observation, and control; the detailed orbital parameters of the launching vehicle; the survey report on the landing area or recovering place; and the documents on detailed orbital parameters of the satellite and the use of frequency resources; for a project being executed at a foreign launching site, copies of the legal documents on orbital parameters, of the launching vehicle and the satellite, and copies of the documents permitting the use of the relevant frequency resources shall be provided; a Chinese satellite

amended to six months or shorter in the context of the new regulation.

Among these documents, a report on the prevention of pollution and space debris is requested, such an approach conforms to the basic principles of China's space law in undertaking space activities, also responding to the appeal of international society. A copy of the "Radio Station License of the People's Republic of China" issued by the Ministry of Industry and Information Technology (MIIT) is another essential document, which corresponds to the ITU regulations.

3. Particularly Considering Two Issues regarding a Launch Permit Application

Among all issues pertaining to the creation of launch permit regulation in China, two are especially important to private space development. They deserve to be given special consideration and are, namely, third-party liability insurance and State recourse from private enterprises after compensating for damages caused by their space activities to a third party.

(1) Space Insurance

National laws on launch permits often specify that an applicant shall either obtain insurance or demonstrate their financial capacity. In the majority of cases, obtaining insurance is one of the authorization conditions. It has been seen as a crucial issue due to the fact that any space activity entails huge risks, which must be taken into account. The 2002 Measures do include a provision on the issue of insurance. It stipulates that: "a permit holder must comply with the relevant national regulations to insure himself against liability incurred in respect to damage or loss suffered by third parties and against other liability incurred by launching a space object."[636] This article, though minimal,

launch enterprise shall provide a copy of the "Radio Station License of the People's Republic of China" issued by the Ministry of Information Industry for the radio station in outer space; (d) the safety design report relating to the project and documents relating to public security; supplementary documents concerning the reliability of key safety system, the effects of the launching vehicle, either in normal condition or malfunction during the launch, to the property and personal safety near the launching site and within the range of the launch track, the prevention from pollution and space debris, and other relevant safety; for a foreign-involved project, the documents concerning policy evaluation, confidentiality and security evaluation must also be submitted.

[636] Art. 19 of the Interim Measures on the Administration of Permits for Civil Space Launch Projects (China, P.R), 2002.

constitutes the legal framework for space insurance.[637] However, one can easily find a discrepancy between this provision and other states' practice. It is the "permit holder" who must purchase insurance before the relevant launch activity, rather than the "applicant of the permit". This means that the conditions for applying a permit as regulated by the 2002 Measures do not include purchasing insurance. Although purchasing insurance is requested before specific launch activities, it is hard to say that no difference exists between these two practices. The high-risk nature of space activities indicates the necessity of insurance; accidents may occur even before conducting a space launch project. Purchasing insurance as a condition of authorization will benefit private participants, especially when they are still in the infant stage of development.

The SASTIND seems to have realized that the clause on insurance in the 2002 Measures takes a different position. In the 2018 Application Guide mentioned above, the documents on purchasing third-party liability insurance and other relevant insurance policies are listed as necessary documents in the application materials. When making an updated authorization regulation, the position of the insurance clause should be changed.

When it refers to the specific issues of space insurance,[638] improvement should also be made in China, especially against the background of increasing private operators intending to participate in space activities. Currently, China does not have detailed rules on space insurance and lacks a clear structure for space insurance, this will no doubt obstruct the smooth development of space activities.[639] Relevant bodies in the fields of space, insurance, finance, and banking should get together to work out an appropriate legal framework for space insurance.[640]

(2) **Private Liability and State Recourse**

The 2002 Measures ignore the provisions on liability and recourse, probably

[637] Zhao, Yun, *National Space Law in China: An Overview of the Current Situation and Outlook for the Future,* Brill, Nijhoff, Leiden, 2015, p. 73.
[638] For further discussion on Chinese space insurance, see ibid., at pp. 71-82.
[639] Ibid., p.88.
[640] Ibid.

because they don't foresee increasing private participation. Space launch activities are the most important and common activities in the space field. Recently, private participation taking place in China has also surrounded launch activities. In this context, regulations on liability and recourse are very necessary. On the one hand, the possibility of causing damages will rise with the increase of private participation. To settle the relationship between the State and private entities in the context of liability will at least protect the State's interests. On the other hand, clarifying the liability of private operators will help them to foresee the worst result of conducting launch activities.

In addition, creating a ceiling for the sum recoverable when a State exercises the right of recourse has been a national space legislation practice recently enacted, as discussed in chapter two. This ceiling could either reflect the amount, which can reasonably be insured, or it can be a fixed sum.[641] This practice is favorable to private operators, and it is an effective way to promote private participation. Thus, in a newly enacted permit regulation, a provision on liability and recourse must be provided for.

In sum, the 2016 white paper recommends improvement to the launch permit regulation, and thus, the 2002 Measures, as well as the Application Guide released by the SATIND in 2018, can be taken as references. The 2002 Measures were created in the context of the deficiency of private space involvement, so the relevant provisions are not qualified to meet the demands of today's situation. The 2018 Application Guide makes several amendments based on the 2002 Measures to respond to new developments. Law-makers with regard to the launch permit regulation need to comprehensively consider all necessary perspectives to enact a regulation which is able to ensure the development of launch activities in China and harmonize with all related international and national conventions, laws and regulations.

II. Other Regulations Apart from the Launch Permit Regulation

In addition to the central space law and the regulation of launch activities permits which have been analyzed above, several other regulations also need

[641] Hobe, Stephan, *The ILA Law for National Space Legislation,* German Journal of Air and Space Law (1) 2013, p. 93.

to be discussed: for example, the regulation of space objects registration, the regulation of satellite data dissemination and regulation regarding aeronautical products/services export control etc. Moreover, in responding to the new developments of other States' national space legislation, it is significant for China to consider the necessity of establishing regulations with respect to space resource mining, sub-orbital flight (tourism) and spaceport operation. In this part of the present research, the major aspects of these issues will be discussed.

1. The Regulation of Space Object Registration

To register space objects launched into outer space is an obligation confirmed by the 1967 OST; thereafter, the 1975 REG regulates specifically the detailed issues of space object registration.

In fulfilling the registration obligation, the "Measures for the Administration of Registration of Space Objects" was published by China in 2001. These "measures" require the owners, the main owners (when more than one exist), of the space objects,[642] or the companies who provide the commercial launching services when the owner of the space objects is foreign[643] to fulfill the registration obligation. These requirements are evaluated as being reasonable compared to the practices of other States.

When referring to the information on the space objects that are to be registered, the norms formulated by the 2001 Measures are qualified to meet international obligations on the one hand and efficient in administrating domestic launching activities on the other hand.

According to the 2016 white paper, the regulation of registration should be improved, indicating that the basic provisions in the 2001 "Registration Measures" will remain the resources. Its major content shall be maintained in any newly established registration regulation; however, the following issues are necessary to stress:

First, an "Administrative Regulation" should replace the "measures" regulating registration activities through which the transparency of national

[642] Art. 7 of the Measures for the Administration of Registration of Space Objects (2001).
[643] Art. 8, ibid.

space activities could be guaranteed, and this will especially favor private operators.

Second, Art. 9 of the 2001 Registration Measures stipulates that the registrant shall amend the information pertaining to the registration when major changes (e.g. a change of orbit, break-up, it ceasing working or re-entry into the atmosphere) of the conditions of the space object registered in accordance with these measures occur within sixty days after the conditions pertaining to the space object have been exchanged. However, the transfer of ownership or control of a space object is not included in these "major changes". In order to adapt to the higher frequency of such changes in space commerce and in response to the recommendations of the UNGA "Resolution on Recommendations on Enhancing the Practice of States and International Intergovernmental Organizations in Registering Space Objects", the date of change in supervision and the identification of the new owner or operator shall be listed as major changes.[644]

2. Regulations of Satellite Data Dissemination and Aeronautical Products/Services Export Control

Legal issues regarding satellite data dissemination and space product export are increasingly important against the background of China's B&R construction. In the context of B&R, a Space Information Corridor (SIC) is intended to be established. This SIC includes the cooperative fields of earth observation, communications and broadcasting, navigation and positioning, and other types of satellite-related development; ground and application system construction; and application product development[645] among the B&R members. According to the "Guiding Opinions" co-published by the Ministry of Industry and Information Technology of the People's Republic China and the National Development and Reform Commission of China,[646]

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644 UNGA Res. 62/101, The 2007 Resolution on Recommendations on Enhancing the Practice of States and International Intergovernmental Organizations in Registering Space Objects, 17 December 2007.
645 Part-V-2-(3), of the 2016 "White Paper".
646 Guiding Opinions on Accelerating the Construction and Application of the "Belt and Road" Spatial Information Corridor, co-published by MIIT and NDRC on 22 October 2016, available at: http://www.ndrc.gov.cn/zcfb/zcfbqt/201611/t20161123_827548.html.

private entities from different B&R States are encouraged to be involved in B&R SIC construction.[647]

For China, regulations with respect to satellite data dissemination are necessary to enact to clarify the relationship between private persons' reasonable business activities and the preservation of State security. Concerning satellite data utilization rules, several legislation practices by other States are desirable to take as references, for example, the American and German laws.

So far, there is no special legal instruments regulating civil space-related products, services and technologies export. Fragmented norms regarding these facets are scattered in the Foreign Trade Law, two administrative regulations complementing the Foreign Trade Law, the Regulation on the Administration of Arms Export Control, the Regulation on Export Control of Missiles and Missile-Related Items and Technologies, the Measure for Administration on Import and Export License for Dual-Use Items and Technologies, and the Measures for the Administration of Technologies Prohibited or Restricted from Export.[648] As described above, the 2016 white paper recommends considering the enactment of a new aeronautics product and service export control regulation. Space technology export is excluded, which means these related regulations that can be found in the aforementioned legal documents are still valid.

However, how to extract the essential clauses merely pertaining to space-related products and service export control seems an impossible mission. SASTIND can hardly achieve formulating this regulation on its own. The Ministry of Defense, Ministry of Commerce, General Administration of Customs and Ministry of Foreign Affairs are all involved. However, this is not an inter-agency mechanism which can definitively tackle this very sensitive, confidential problem, especially when the military is implicated.

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[647] Ibid. See also a summary of the "Guiding Opinions "made by the State Council Information Office of P.R.C, available at: http://www.scio.gov.cn/xwfbh/xwbfbh/wqfbh/33978/35700/zy35704/Document /1537064/1537064.htm.

[648] The technologies prohibited from export included in the Catalogue of Technologies Prohibited or Restricted from Export by China shall not be exported. The export of technologies restricted by the state from export shall be subject to the export licensing formalities under the Measures for the Administration of Technologies Prohibited or Restricted from Export (2009).

Another crucial issue which must be emphasized regarding export control rules on space items is that China currently does not have membership of any major international export control mechanisms, for example, the Missile Technology Control Regime,[649] or the Wassenaar Arrangement.[650] This may constitute a barrier to China sponsoring large scale cooperation programs concerning space in the future. However, the absence of the main export control international regimes is unable to be settled at the domestic level by creating national laws, international negotiations are required.

In short, the enactment of a regulation on space-related product and service export control may not emerge in a short period of time; however, it has been listed as space legislative policy at least.

3. China's Regulations on Space Resource Mining, Sub-orbital Flight and Spaceport Operation?

Chapter III of the present research introduces national legislation on the new scope of space activities besides the conventional areas of commercial space activities, i.e., asteroid mining, sub-orbital flight and tourism, as well as private spaceport operation. China's space policy has not yet looked at these issues when showing its determination on the creation of a space legal system. Nonetheless, these aspects are bundled closely with Chinese space endeavor.

(1) Regulations on Space Resources Mining

On 2nd January 2019, China's Chang'e 4 made a historic first landing on the far side of the Moon, unveiling the Moon's less-known side to the whole world.[651] On 13 December 2015, China's Chang'e 2 flew as close as 3.2 kilometers past asteroid Toutatis, which is about 7 million kilometers away from the Earth. It managed to capture close pictures of the asteroid, making

[649] The creation of MTCR is to restrict the proliferation of missiles, complete rocket systems, unmanned air vehicles, and related technology for those systems capable of carrying a 500-kilogram payload at least 300 kilometers, as well as systems intended for the delivery of weapons of mass destruction (WMD). For more information on the MTCR, see: http://mtcr.info/.

[650] The WA has been established in order to contribute to regional and international security and stability, by promoting transparency and greater responsibility in transfers of conventional arms and dual-use goods and technologies, thus preventing destabilizing accumulations. The aim is also to prevent the acquisition of these items by terrorists. The specifics of the WA can be found at: https://www.wassenaar.org/.

[651] Lunsford, Christine, *Photos from the Moon's Far Side! China's Chang'e 4 Lunar Landing in Pictures,* see: https://www.space.com/42887-china-moon-far-side-landing-photos-chang-e-4.html.

China the fourth country, after the United States, the European Union, and Japan, to examine an asteroid from an unmanned spacecraft.[652] China's Aerospace Science and Technology Corporation issued a report claiming that China will achieve a breakthrough by 2040 with regard to "nuclear-powered space shuttles." This breakthrough will enable the mining of space-based resources, including from asteroids.[653] Taking into account these efforts undertaken to gather knowledge about the Moon's resources, as well as its ambitious plans for further exploration of the Moon and other celestial bodies, it is safe to say that China is one of the States most affected by the emergence of national space mining laws.[654] Although the 2015 U.S. Space Act evoked universal controversy, China didn't clearly take a stance on this matter, instead, China displays a wait-and-see attitude.

At the present stage, there is no need for China to enact regulations on outer space resource mining.

First, U.S. private space companies have already proposed ambitious plans to achieve mining asteroids' resources. The key reason behind the adoption of both the U.S.' and Luxembourg's laws was the pressure exercised by private companies for the enactment of legislation supporting their space resource utilization plans.[655] However, there are no private companies in China expressed the willingness to do this. China's capabilities in deep space exploration and its eye-catching programs are all limited to the governmental level. China lacks the fundamental motivation to enact a similar regulation.

Second, space resource mining is still a pending matter, which the international community needs to solve. States' attitude may gradually change alongside the cognition of the international community. At this phase, it is not wise to rush to help legitimate U.S. practice or oppose this action.

Third, China shall bear in mind that cultivating private companies' deep space capabilities should not be ignored. Although there are no specific

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652 David, Leonard, *Chinese Spacecraft Flies by Asteroid Toutatis,* 17 December 2012, https://www.space.com/18933-chinese-probe-asteroid-toutatis-flyby.html.
653 He, Tian, *China Sees 'Breakthrough' in Nuclear-Powered Space Shuttles by 2040,* Global Times (17 November) 2017, http://www.globaltimes.cn/content/1075834.shtml.
654 Liu, Hao/Tronchetti, Fabio, *Should the Red Dragon Arise? Assessing China's Options vis-a-vis the Enactment of a Domestic Space Resources Utilization Law,* Space Policy (39-40) 2017, p. 11.
655 Ibid.

regulations pertaining to space resource mining, non-governmental participation in deep space exploration activities at least can be regulated through launch permits' administrative regulation.

(2) Regulations on Sub-Orbital Flights

It seems that mankind will soon be confronted with regular sub-orbital flights. This kind of flight constitutes a technological novelty; however, a specific international legal framework has not yet been made. In this context, national space legislation plays a vital role. The UK Space Industry Act is instructive, not only to acknowledge the existence of any government recognition of the importance of the space industry especially on the issues of sub-orbital activities, but also to provide an example of a regulating framework for those States engaging in space activities.

In China, as mentioned, the newly founded space company OneSpace has accomplished sub-orbital flight. Undoubtedly, this kind of activity will now be conducted frequently. In the long run, China needs to consider enacting sub-orbital flight regulations, especially as it should value the huge profits produced by the sub-orbital flight market. However, considering the lacking international standards and the few legislation practices from other States, China should rather refrain from making specific regulations. Once the administrative regulation of launch permits is formulated, sub-orbital flight activity can be authorized by invoking its provisions temporarily. When legislation conditions are mature, for example when private sub-orbital flights reach a certain threshold, separate administrative regulation can be emphasized.

(3) Regulations on Spaceport Operation

The Chinese government has already built four full-feature launch sites with world-class equipment to serve nearly all kinds of launches. With commercial and private space activities having deepened in China, it will in the future demand more spaceport services. The real future of space exploration is centered around dozens of commercial spaceports. Unlike the UK, China does not have the urgency of building spaceports; there is also no fierce

competition with other states. However, the instructive acknowledgement provided by the UK Act should motivate the Chinese government to reconsider the operation mode of spaceports. Privately operated spaceport may not be realized in the near future, but cooperation between the government and private companies may create a new path to better allocate various resources. Moreover, in order to grasp a foothold on this profitable area when other nations are making efforts to do so, currently, it makes more sense to enact a regulation concerning the better utilization of government-owned launch sites by private entities.

D. Chapter Conclusion

Based on a study of the previous Chapters, this final Chapter tackles one problem, i.e., what should be contained in China's space legislation. China's 2016 space policy outlined the basic framework, it is recommended that a space legal system, including one central space law and several administrative regulations, be established. This Chapter proposed the essential content for China's future space legislation.

Prior to the specific analysis of the space legal system, the legislative procedure and the qualified departments for enacting laws and administrative regulations in China have been outlined.

Considered its international obligations, space policies and activities, it is necessary for China's central space law to contain provisions concerning the purposes, fundamental principles, concrete obligations of central and local governments and basic measures. Principles include the peaceful exploration and uses of outer space, environmental preservation, innovative development, coordinated development, promoting private participation in space activities and international cooperation. In addition, model provisions for specifying these principles should be drafted.

Underpinning the central space law, administrative regulations governing specific activities are indispensable. The launch permit regulation fully deserves to be a regulation of the utmost importance. Improvements based on the 2002 Measures should be formulated to ensure the development

of private launch activities. Completed registration regulation should parallel international practice.

Currently, China has not enacted any legal documents directly supervising satellite data dissemination and aeronautical products export control. Fragmental rules scattered in other domestic laws and administrative regulations are mere references. An intricate network weaved with military sensibility and national security renders these regulations' enactment still a long way.

In addition to the content mentioned explicitly in China's 2016 white paper, this Chapter also analyzed the space resource mining, sub-orbital flight/tourism and private spaceport operation in China. As concluded, China does not have the urgent need to legislate on these matters due to its infant stage of space privatization, but it should not underrate their influences in commercial space markets.

Conclusion

China, as an eye-catching space nation of the world, has obtained impressive achievements in space science and technologies. However, compared to the other space powers, China is the only one that has not enacted formal national space law. Against the background of strengthening the rule of law in China, this research aims to propose essential content for China's space legislation based on a study of national space legislation.

In contrast to many other kinds of national legislation, space legislation is initially motivated by the international space treaties. It is recognized that Art. VI OST imposes an international obligation on States that States shall authorize and continuously supervise the activities of non-governmental entities. Art. VII OST imposes the duty on State Parties to provide compensation for damage resulting from all launching operations, regardless of whether the launching operation is initiated by governmental or non-governmental entities. Art. VIII OST specifies that a State Party to the Treaty, on whose registry an object launched into outer space is carried, shall retain jurisdiction and control over such an object, and over any personnel thereof, while in outer space or on a celestial body. This article is mainly relevant to the issue of jurisdiction but embodies the content of national registries. This thesis acknowledges that these articles in the Outer Space Treaty are the most important legal basis for national space legislation, while the other space treaties also provide concrete obligations on domestic space regulations because they are generally seemed to be drafted as a supplementary set of rules designed to expand on the provisions of the OST.

It is notable that the space treaties were drafted when States were the only players in outer space, private participation was almost ignored. With the rapid development of space science, technologies and applications thereof, the civilian and commercial uses of outer space are being realized with the exception of the military purpose, which was primarily focused on during the Cold War period when the space age had just begun. More States and private entities are joining the space field to share the juicy fruits of space

development. Accordingly, the demands on international and national law have changed gradually. The international space treaties thus failed to accommodate the technical, political and commercial progress of space activities. The legal framework to regulate the privatization and commercialization of space activities was largely inadequate. Under such circumstances, on the international plane, the principles, declarations and recommendations elaborated by the UNCOPUOS and adopted by the UN General Assembly came into being as so-called soft law to provide specific guidance and technical norms. In respective States, national space legislation no longer acts only as the instrument to fulfil international obligations but bears the functions of creating a stable legal environment and providing amicable norms for ensuring private enterprises' growth.

In order to extract the basic content of national space legislation, this thesis turns to the existing national space regulations. The international treaties motivate the States to take domestic measures to oversee their private space activities but leave the discretion on the detailed rules to the States themselves. From an overview of the existing national space legislation, a remarkable diversity in their scope, extent and approach exists because States have regard to their specific needs and practical considerations when drafting their national regulations. Although the existing practices are diverse, in the research process, this thesis accomplishes extracting the basic content by examining the ILA Model Law and the Natleg Resolution, which aim to achieve a certain degree of uniformity or harmonization and in the meantime to provide a major reference for States, which have not enacted national regulations. The regulations on the scope of application and jurisdiction, authorization and the conditions for authorization, continuing supervision and enforcement, registration, recourse and insurance and the transfer of space activities constitute the basic content of national space legislation.

Besides the basic content of national space legislation, this thesis also observes the new developments of the content in recent years. Following on from private enterprises gradually becoming the leading force in the space area, national space legislation has started to deal with many other contents.

Some States even formulate domestic laws to cover events that are not or are not yet explicitly regulated by the international treaties and other international instruments. This thesis chooses to examine the regulations on space resource mining, sub-orbital flight and private spaceport operation and finds that they are strong proof demonstrating that States are desiring to shape domestic space regulations to meet their diverse domestic needs and are also to be regarded as the commercial space focal points of future national space legislation.

Before this thesis concludes the essential content of China's future space legislation, relevant circumstances in China have been analyzed. This research expounds China's space policies, China's space capabilities and the status quo of China's space law. In the context of the policies which favor the development of Chinese private space participation, several private space companies have already made achievements. National space legislation efforts are constantly advancing. The 2016 White Paper outlines that China's space legislation is intended to be formulated as a system. The enactment of space law is established as its core, supported by administrative regulations concerning specific space areas. This is welcomed by this research's findings as the scope of national space law is dynamic, new developments regarding its content constantly emerge. A well-structured space legal system will function more flexibly and promptly.

This thesis finally proposes the essential content of China's space legislation to realize the research purpose. To implement international obligations, administrate and facilitate non-governmental space activities, the central space law should include the fundamental legal principles, *inter alia,* the peaceful exploration and use of outer space, protection of the space environment, the innovative development of space activities, the coordinated development of space activities, encouragement of private participation in space programs and the promotion of international cooperation etc. The peaceful utilization; protecting the environment and international cooperation come from the basic principles regulated by the 1967 OST, with which governmental and non-governmental sectors are both obliged to comply when

undertaking space activities. The protection of the environment is even taken as a precondition for authorizing private space activities. Innovation and coordination in the development of space activities, as well as supporting private involvement in space activities, are the direct beneficiary principles to promote China's space commercialization and privatization.

The indispensable administrative regulations on launch permits and registration may be enacted by the modification of the 2001 and 2002 measures considering the preeminent conclusions made by the international initiatives. Privately supported legal measures, like formulating an appropriate threshold for insurance, a proper liability ceiling for the State to obtain resource from private actors etc., have been proposed. The other regulations relating to satellite data dissemination, aeronautics product/technology export control are not basic components of domestic space legislation, which need more coordinated work to be conducted and are therefore valuable further research topics.

As to the privately-dominant feature of the new content, this thesis regards China as not having an urgent need to legislate on such matters due to its infant stage of space privatization, but it should not underestimate their influence on the commercial space markets. The possibility of enacting regulations needs to be preserved.

Based on the study of national space legislation, this thesis proposes the essential content for Chinese national space legislation. Hopefully, on the road to pursuing the rule of law, China's space legislation will be created to implement treaty obligations, meet the national demand for ensuring the rapid development of private space activities, and will simultaneously ensure the competitiveness of China's space activities by recognizing other space-faring States' development with regard to domestic space legislation and adopt appropriate countermeasures when necessary.

Acronyms and Abbreviations

APSCO	Asia-Pacific Space Cooperation Organization
ARRA	Rescue Agreement
B&R	One Belt & One Road Initiative
BDS	Beidou Navigation Satellite System
Brexit	"British" and "Exit"- United Kingdom's Withdrawal from the European Union
BRICS	Brazil, Russia, India, China and South Africa
BSL	2008 Basic Space Law (Japan)
CD	Conference on Disarmament
CMI	Civil-Military Integration
CNSA	China National Space Administration
CSTIND	Commission for Science, Technology and Industry for National Defense (China)
DSI	Deep Space Industries (Corporation)
ESA	European Space Agency
EUR	Euro (s)
FAA	Federal Aviation Administration
GAD	General Armaments Department
GNSS	Global Navigation Satellite System
GTO	Earth Geostationary Transfer Orbit
IADC	Inter-Agency Space Debris Coordination Committee
ICAO	International Civil Aviation Organization
IISL	International Institute of Space Law
ILA	International Law Association
ITU	International Telecommunication Union
LEO	Low Earth Orbit
LIAB	Liability Convention
LS Resolution	Resolution on the Application of the Concept of the "Launching State"
MCI	Military-Civil Integration
MIIT	Ministry of Industry and Information Technology (China)
MOFA	Ministry of Foreign Affairs (China)
MOON	Moon Agreement
MTCR	Missile Technology Control Regime
NASA	National Aeronautics and Space Administration (USA)
NatLeg Resolution	Resolution on Recommendations on National

	Legislation Relevant to the Peaceful Exploration and Use of Outer Space
NDRC	National Development and Reform Commission (China)
OST	Outer Space Treaty
PLA	People's Liberation Army (China)
PR	Planetary Resources (Corporation)
PRC	People's Republic of China
REG	Registration Convention
RegPract Resolution	Recommendations on Enhancing the Practice of States and International Intergovernmental Organizations in Registering Space Objects
SASTIND	State Administration of Science, Technology and Industry for National Defense (China)
SatDSIG	German Satellite Data Security Act
SIC	Space Information Corridor
SSO	Solar Synchronous Orbit
TT&C Systems	Tracking, Telemetry and Command Systems
U.S. / USA	United States of America
UK	United Kingdom
UN	United Nations
UN COPUOS	United Nations Committee on the Peaceful Uses of Outer Space
UN GA	United Nations General Assembly
UN OOSA	United Nations Office for Outer Space Affairs
WA	Wassenaar Arrangement

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Annex

Annex I: UN resolutions (including other documents) relating to requirements for the compliance with treaty law, as well as national space legislation and registration

I. Application of the Concept of the "Launching State" (LS Resolution)

Adopted by the UN General Assembly:	10 December 2004
	adopted without a vote
	UNGA Res. 59/115

United Nations A/RES/59/115

General Assembly

Distr.: General
25 January 2005

Fifty-ninth session
Agenda item 74

Resolution adopted by the General Assembly

[*on the report of the Special Political and Decolonization Committee (Fourth Committee) (A/59/469)*]

59/115. Application of the concept of the "launching State"

The General Assembly,

Recalling the Convention on International Liability for Damage Caused by Space Objects[1] and the Convention on Registration of Objects Launched into Outer Space,[2]

Bearing in mind that the term "launching State" as used in the Liability Convention and the Registration Convention is important in space law, that a launching State shall register a space object in accordance with the Registration Convention and that the Liability Convention identifies those States which may be liable for damage caused by a space object and which would have to pay compensation in such a case,

Taking note of the report of the Committee on the Peaceful Uses of Outer Space on its forty-second session[3] and the report of the Legal Subcommittee on its forty-first session, in particular the conclusions of the Working Group on the agenda item entitled "Review of the concept of the 'launching State'" annexed to the report of the Legal Subcommittee,[4]

Noting that nothing in the conclusions of the Working Group or in the present resolution constitutes an authoritative interpretation of or a proposed amendment to the Registration Convention or the Liability Convention,

Noting also that changes in space activities since the Liability Convention and the Registration Convention entered into force include the continuous development of new technologies, an increase in the number of States carrying out space activities, an increase in international cooperation in the peaceful uses of outer space and an increase in space activities carried out by non-governmental entities, including activities carried out jointly by government agencies and non-

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[1] General Assembly resolution 2777 (XXVI), annex.

[2] General Assembly resolution 3235 (XXIX), annex.

[3] *Official Records of the General Assembly, Fifty-fourth Session, Supplement No. 20* and corrigendum (A/54/20 and Corr.1).

[4] A/AC.105/787, annex IV, appendix.

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governmental entities, as well as partnerships formed by non-governmental entities from one or more countries,

Desirous of facilitating adherence to and the application of the provisions of the United Nations treaties on outer space, in particular the Liability Convention and the Registration Convention,

1. *Recommends* that States conducting space activities, in fulfilling their international obligations under the United Nations treaties on outer space, in particular the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies,[5] the Convention on International Liability for Damage Caused by Space Objects[1] and the Convention on Registration of Objects Launched into Outer Space,[2] as well as other relevant international agreements, consider enacting and implementing national laws authorizing and providing for continuing supervision of the activities in outer space of non-governmental entities under their jurisdiction;

2. *Also recommends* that States consider the conclusion of agreements in accordance with the Liability Convention with respect to joint launches or cooperation programmes;

3. *Further recommends* that the Committee on the Peaceful Uses of Outer Space invite Member States to submit information on a voluntary basis on their current practices regarding on-orbit transfer of ownership of space objects;

4. *Recommends* that States consider, on the basis of that information, the possibility of harmonizing such practices as appropriate with a view to increasing the consistency of national space legislation with international law;

5. *Requests* the Committee on the Peaceful Uses of Outer Space, in making full use of the functions and resources of the Secretariat, to continue to provide States, at their request, with relevant information and assistance in developing national space laws based on the relevant treaties.

71st plenary meeting
10 December 2004

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[5] General Assembly resolution 2222 (XXI), annex.

II. **Resolution on Recommendations on Enhancing the Practice of State and International Intergovernmental Organizations in Registering Space Objects**

Adopted by the UN General Assembly: 17 December 2007

adopted without a vote

UNGA Res. 62/101

United Nations A/RES/62/101

General Assembly

Distr.: General
10 January 2008

Sixty-second session
Agenda item 31

Resolution adopted by the General Assembly

[*on the report of the Special Political and Decolonization Committee (Fourth Committee) (A/62/403)*]

62/101. Recommendations on enhancing the practice of States and international intergovernmental organizations in registering space objects

The General Assembly,

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[1] (Outer Space Treaty), in particular articles VIII and XI,

Recalling also the Convention on Registration of Objects Launched into Outer Space,[2]

Recalling further its resolution 1721 B (XVI) of 20 December 1961,

Recalling its resolution 41/66 of 3 December 1986,

Taking note of the relevant parts of the report of the Committee on the Peaceful Uses of Outer Space on its fiftieth session[3] and the report of the Legal Subcommittee on its forty-sixth session, in particular the conclusions of the Working Group on the Practice of States and International Organizations in Registering Space Objects, annexed to the report of the Legal Subcommittee,[4]

Noting that nothing in the conclusions of the Working Group or in the present resolution constitutes an authoritative interpretation of or a proposed amendment to the Registration Convention,

Bearing in mind the benefits for States of becoming parties to the Registration Convention and that, by acceding to, implementing and observing the provisions of the Registration Convention, States:

(*a*) Enhance the utility of the Register of Objects Launched into Outer Space established under article III of the Registration Convention, in which information

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[1] United Nations, *Treaty Series*, vol. 610, No. 8843.

[2] Ibid., vol. 1023, No. 15020.

[3] *Official Records of the General Assembly, Sixty-second Session, Supplement No. 20* (A/62/20), paras. 209–215.

[4] See A/AC.105/891, annex III, appendix.

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furnished by States and international intergovernmental organizations conducting space activities that have declared their acceptance of the rights and obligations under the Registration Convention is recorded;

(*b*) Benefit from additional means and procedures that assist in the identification of space objects, including, in particular, in accordance with article VI of the Registration Convention,

Noting that States parties to the Registration Convention and international intergovernmental organizations conducting space activities, having declared their acceptance of the rights and obligations under the Convention, shall furnish information to the Secretary-General in accordance with the Convention and shall establish an appropriate registry and inform the Secretary-General of the establishment of such a registry in accordance with the Convention,

Considering that universal accession to and acceptance, implementation and observance of the provisions of the Registration Convention:

(*a*) Lead to increased establishment of appropriate registries;

(*b*) Contribute to the development of procedures and mechanisms for the maintenance of appropriate registries and the provision of information to the Register of Objects Launched into Outer Space;

(*c*) Contribute to common procedures, at the national and international levels, for registering space objects with the Register;

(*d*) Contribute to uniformity with regard to the information to be furnished and recorded in the Register concerning space objects listed in the appropriate registries;

(*e*) Contribute to the receipt of and recording in the Register of additional information concerning space objects on the appropriate registries and information on objects that are no longer in Earth orbit,

Noting that changes in space activities since the Registration Convention entered into force include the continuous development of new technologies, an increase in the number of States carrying out space activities, an increase in international cooperation in the peaceful uses of outer space and an increase in activities carried out by non-governmental entities, as well as partnerships formed by non-governmental entities from more than one country,

Desirous of achieving the most complete registration of space objects,

Desirous also of enhancing adherence to the Registration Convention,

1. *Recommends*, with regard to adherence to the Registration Convention,[2] that:

(*a*) States that have not yet ratified or acceded to the Registration Convention should become parties to it in accordance with their domestic law and, until they become parties, furnish information in accordance with General Assembly resolution 1721 B (XVI);

(*b*) International intergovernmental organizations conducting space activities that have not yet declared their acceptance of the rights and obligations under the Registration Convention should do so in accordance with article VII of the Convention;

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2. *Also recommends*, with regard to the harmonization of practices, that:

(*a*) Consideration should be given to achieving uniformity in the type of information to be provided to the Secretary-General on the registration of space objects, and such information could include, inter alia:

(i) The Committee on Space Research international designator, where appropriate;

(ii) Coordinated Universal Time as the time reference for the date of launch;

(iii) Kilometres, minutes and degrees as the standard units for basic orbital parameters;

(iv) Any useful information relating to the function of the space object in addition to the general function requested by the Registration Convention;

(*b*) Consideration should be given to the furnishing of additional appropriate information to the Secretary-General on the following areas:

(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;

(*c*) States conducting space activities and international intergovernmental organizations that have declared their acceptance of the rights and obligations under the Registration Convention should, when they have designated focal points for their appropriate registries, provide the Office for Outer Space Affairs of the Secretariat with the contact details of those focal points;

3. *Further recommends*, in order to achieve the most complete registration of space objects, that:

(*a*) Due to the complexity of the responsibility structure in international intergovernmental organizations conducting space activities, a solution should be sought in cases where an international intergovernmental organization conducting space activities has not yet declared its acceptance of the rights and obligations under the Registration Convention, and a general backup solution should be provided for registration by international intergovernmental organizations conducting space activities in cases where there is no consensus on registration among the States members of such organizations;

(*b*) The State from whose territory or facility a space object has been launched should, in the absence of prior agreement, contact States or international intergovernmental organizations that could qualify as "launching States" to jointly determine which State or entity should register the space object;

(*c*) In cases of joint launches of space objects, each space object should be registered separately and, without prejudice to the rights and obligations of States, space objects should be included, in accordance with international law, including the relevant United Nations treaties on outer space, in the appropriate registry of the

State responsible for the operation of the space object under article VI of the Outer Space Treaty;[1]

(*d*) States should encourage launch service providers under their jurisdiction to advise the owner and/or operator of the space object to address the appropriate States on the registration of that space object;

4. *Recommends* that, following the change in supervision of a space object in orbit:

(*a*) The State of registry, in cooperation with the appropriate State according to article VI of the Outer Space Treaty, could furnish to the Secretary-General additional information, such as:

(i) The date of change in supervision;

(ii) The identification of the new owner or operator;

(iii) Any change of orbital position;

(iv) Any change of function of the space object;

(*b*) If there is no State of registry, the appropriate State according to article VI of the Outer Space Treaty could furnish the above information to the Secretary-General;

5. *Requests* the Office for Outer Space Affairs:

(*a*) To make available to all States and international intergovernmental organizations a model registration form reflecting the information to be provided to the Office for Outer Space Affairs, to assist them in their submission of registration information;

(*b*) To make public, through its website, the contact details of the focal points;

(*c*) To establish web links on its website to the appropriate registries that are available on the Internet;

6. *Recommends* that States and international intergovernmental organizations should report to the Office for Outer Space Affairs on new developments relating to their practice in registering space objects.

75th plenary meeting
17 December 2007

III. The 2013 Resolution on Recommendation on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space

Adopted by the UN General Assembly: 11 December 2013

adopted without a vote

UNGA Res. 68/74

General Assembly

Distr.: General
16 December 2013

Sixty-eighth session
Agenda item 50

Resolution adopted by the General Assembly on 11 December 2013

[*on the report of the Special Political and Decolonization Committee (Fourth Committee) (A/68/423)*]

68/74. Recommendations on national legislation relevant to the peaceful exploration and use of outer space

The General Assembly,

Emphasizing the importance of appropriate means of ensuring that outer space is used for peaceful purposes and that the obligations under international law and those specifically contained in the United Nations treaties on outer space [1] are implemented,

Recalling its resolutions 59/115 of 10 December 2004 on the application of the concept of the "launching State" and 62/101 of 17 December 2007 on recommendations on enhancing the practice of States and international intergovernmental organizations in registering space objects,

Taking note of the work of the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space and the report of its Working Group on National Legislation Relevant to the Peaceful Exploration and Use of Outer Space on the work conducted under its multi-year workplan,[2]

Noting that nothing in the conclusions of the Working Group or in the present recommendations constitutes an authoritative interpretation or a proposed amendment to the United Nations treaties on outer space,

Observing that, in view of the increasing participation of non-governmental entities in space activities, appropriate action at the national level is needed, in particular with respect to the authorization and supervision of non-governmental space activities,

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[1] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (United Nations, *Treaty Series*, vol. 610, No. 8843); Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (United Nations, *Treaty Series*, vol. 672, No. 9574); Convention on International Liability for Damage Caused by Space Objects (United Nations, *Treaty Series*, vol. 961, No. 13810); Convention on Registration of Objects Launched into Outer Space (United Nations, *Treaty Series*, vol. 1023, No. 15020); and Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (United Nations, *Treaty Series*, vol. 1363, No. 23002).

[2] A/AC.105/C.2/101.

13-44389

Noting the need to maintain the sustainable use of outer space, in particular by mitigating space debris, and to ensure the safety of space activities and minimize the potential harm to the environment,

Recalling the provisions contained in the United Nations treaties on outer space with respect to providing information, to the greatest extent feasible and practicable, on the activities carried out in outer space, in particular through registration of objects launched into outer space,

Noting the need for consistency and predictability with regard to the authorization and supervision of space activities and the need for a practical regulatory system for the involvement of non-governmental entities to provide further incentives for enacting regulatory frameworks at the national level, and noting that some States also include national space activities of a governmental character within that framework,

Recognizing the different approaches taken by States in dealing with various aspects of national space activities, namely by means of unified acts or a combination of national legal instruments, and noting that States have adapted their national legal frameworks according to their specific needs and practical considerations and that national legal requirements depend to a high degree on the range of space activities conducted and the level of involvement of non-governmental entities,

Recommends the following elements for consideration, as appropriate, by States when enacting regulatory frameworks for national space activities, in accordance with their national law, taking into account their specific needs and requirements:

1. The scope of space activities targeted by national regulatory frameworks may include, as appropriate, the launch of objects into and their return from outer space, the operation of a launch or re-entry site and the operation and control of space objects in orbit; other issues for consideration may include the design and manufacture of spacecraft, the application of space science and technology, and exploration activities and research;

2. The State, taking into account its obligations as a launching State and as a State responsible for national activities in outer space under the United Nations treaties on outer space, should ascertain national jurisdiction over space activities carried out from territory under its jurisdiction and/or control; likewise, it should issue authorizations for and ensure supervision over space activities carried out elsewhere by its citizens and/or legal persons established, registered or seated in territory under its jurisdiction and/or control, provided, however, that if another State is exercising jurisdiction with respect to such activities, the State should consider forbearing from duplicative requirements and avoid unnecessary burdens;

3. Space activities should require authorization by a competent national authority; such authority or authorities, as well as the conditions and procedures for granting, modifying, suspending and revoking the authorization, should be set out clearly within the regulatory framework; States might employ specific procedures for the licensing and/or for the authorization of different kinds of space activities;

4. The conditions for authorization should be consistent with the international obligations of States, in particular under the United Nations treaties on outer space, and with other relevant instruments, and may reflect the national security and foreign policy interests of States; the conditions for authorization should help to ascertain that space activities are carried out in a

safe manner and to minimize risks to persons, the environment or property and that those activities do not lead to harmful interference with other space activities; such conditions could also relate to the experience, expertise and technical qualifications of the applicant and could include safety and technical standards that are in line, in particular, with the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space;[3]

5. Appropriate procedures should ensure continuing supervision and monitoring of authorized space activities by applying, for example, a system of on-site inspections or a more general reporting requirement; enforcement mechanisms could include administrative measures, such as the suspension or revocation of the authorization, and/or penalties, as appropriate;

6. A national registry of objects launched into outer space should be maintained by an appropriate national authority; operators or owners of space objects for which the State is considered to be the launching State or the State responsible for national activities in outer space under the United Nations treaties on outer space should be requested to submit information to the authority to enable the State on whose registry such objects are carried to submit the relevant information to the Secretary-General of the United Nations in accordance with applicable international instruments, including the Convention on Registration of Objects Launched into Outer Space,[4] and in consideration of General Assembly resolutions 1721 B (XVI) of 20 December 1961 and 62/101 of 17 December 2007; the State may also request information on any change in the main characteristics of space objects, in particular when they have become non-functional;

7. States could consider ways of seeking recourse from operators or owners of space objects if their liability for damage under the United Nations treaties on outer space has become engaged; in order to ensure appropriate coverage for damage claims, States could introduce insurance requirements and indemnification procedures, as appropriate;

8. Continuing supervision of the space activities of non-governmental entities should be ensured in the event of the transfer of ownership or control of a space object in orbit; national regulations may provide for authorization requirements with regard to the transfer of ownership or obligations for the submission of information on the change in status of the operation of a space object in orbit.

65th plenary meeting
11 December 2013

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[3] *Official Records of the General Assembly, Sixty-second Session, Supplement No. 20* (A/62/20), annex.

[4] United Nations, *Treaty Series*, vol. 1023, No. 15020.

IV. **Sofia Guidelines for a Model Law on National Space Legislation**

Adopted on the 75th Conference of the International Law Association held in Sofia, Bulgaria, 26 to 30 August 2012

Resolution No. 6/2012

RESOLUTION No. 6/2012

SPACE LAW

The 75th Conference of the International Law Association held in Sofia, Bulgaria, 26 to 30 August 2012:

HAVING CONSIDERED the Sofia Conference Report on Legal Aspects of the Privatisation and Commercialisation of Space Activities of the Space Law Committee;

NOTING the work carried out by this Committee on the topic and preliminary conclusions and recommendations submitted to the Berlin (2004), Toronto (2006), Rio de Janeiro (2008), The Hague (2010) and Sofia (2012) ILA Conferences;

NOTING FURTHER the comments and findings of the Committee on the different topics and issues discussed during the four above-mentioned Conferences and in the present Report, and recognising the importance of these questions in the current international and regional scenarios;

TAKING INTO ACCOUNT the treatment of these topics by the United Nations Committee for the Peaceful Uses of Outer Space and both its Subcommittees and the contribution of the International Law Association Committee members to the work of this institution and that of the Permanent Court of Arbitration;

TAKES NOTE OF the Report of the Space Law Committee (Part I and Part II) and the proposals and recommendations made by the Committee to the Sofia Conference with regard to remote sensing, the use of satellite data in international litigation, dispute settlement, space debris and national legislation[1];

ADOPTS the Sofia Guidelines for a Model Law on National Space Legislation annexed hereto;

COMMENDS the work of the Space Law Committee;

REQUESTS the Secretary-General of the International Law Association to forward the Report of the Space Law Committee and this Resolution for consideration by the United Nations Secretariat, the United Nations Committee on the Peaceful Uses of Outer Space and its Legal and Scientific and Technical Subcommittees, the Vienna Office for Outer Space Affairs, the Permanent Court of Arbitration and other relevant governmental and non-governmental organisations.

[1] Comments by the Committee Chair may be found in the Committee Report.

ANNEX

Sofia Guidelines for a Model Law on National Space Legislation[2]

Article 1 - Scope of Application

The present law applies to space activities carried out by citizens of XY or legal persons incorporated in XY and space activities carried out within the territory of XY or on ships or aircraft registered in XY.

Article 2 – Definitions – Use of Terms

The following definitions will apply for the purposes of this law:

Space activity

The term 'space activity' includes the launch, operation, guidance, and re-entry of space objects into, in and from outer space and other activities essential for the launch, operation, guidance and re-entry of space objects into, in and from outer space.

Space object

The term 'space object' refers to any object launched or intended to be launched into outer space, including its component parts as well as its launch vehicle and parts thereof.

Operator

The term 'operator' refers to a natural or legal person carrying out space activities.

Authorisation

Licence delivered in written form.

Supervision

A system established for permanent observation and tracking of space activities.

Commercial space activity

A space activity for the purpose of generating revenue or profit whether conducted by a governmental or by a non-governmental entity.

Article 3 – Authorisation

All space activities are subject to authorisation. Authorisation shall be granted by the minister of (e.g. the competent minister or authority).

Article 4 – Conditions for Authorisation

(1) Authorisation shall be granted under the following conditions:

(a) The operator is in a financial position to undertake space activities,

[2] Explanatory notes by the Committee Rapporteur are to be found in the Committee Report.

(b) The operator is shown to be reliable and to have the required technical knowledge,

(c) The space activity does not cause environmental damage to the Earth and outer space in accordance with Article 7.

(d) The space activity is undertaken in such a manner as to mitigate to the greatest possible extent any potential space debris in accordance with Article 8.

(e) The space activity is compatible with public safety standards,

(f) The space activity does not run counter to national security interests,

(g) The space activity does not run counter to international obligations and foreign policy interests of XY,

(h) The operator has complied with ITU Regulations with regard to frequency allocations and orbital positions,

(i) The operator complies with insurance requirements as determined in Article 12.

(2) In order to prove fulfilment of the conditions mentioned in paragraph (1), the operator should submit appropriate documentation and evidence (as specified in an implementing decree/regulation).

(3) The authorisation may contain conditions and requirements.

Article 5 – Supervision

All space activities shall be subject to continuing supervision by the ministerial authority under conditions to be laid down in an implementing decree or regulation.

Article 6 – Withdrawal, Suspension or Amendment of Authorisation

The respective authority may withdraw, suspend or amend the authorisation, when either the conditions of Article 4, paragraph 1, or the specific requirements of Article 4, paragraph 3 are not observed.

Article 7 – Protection of the Environment

(1) Space activities shall not cause environmental damage to the Earth and outer space or parts thereof, either directly or indirectly.

(2) An environmental impact assessment is required before the beginning of a space activity.

(3) Details of the environmental impact assessment shall be laid down in an implementing decree/regulation.

Article 8 – Mitigation of Space Debris

(1) Space activities shall be carried out in such a manner as to mitigate to the greatest possible extent any potential space debris in accordance with Article 4(d).

(2) The obligation under paragraph 1 includes the obligation to limit debris released during normal operations, to minimise the potential for in-orbit break-ups, to prepare for post- mission disposal and to avoid in-orbit collisions in accordance with international space debris mitigation standards.

Article 9 – Transfer of Space Activity

The transfer of a space activity and/or a space object to another operator is subject to prior authorisation by the competent authority. Authorisation will be granted under the conditions laid down in Article 4.

Article 10 – Registration

(1) A national register is hereby established for the registration of space objects. The authority (namely the competent minister, preferably the same as in Article 3) shall maintain the national space register.

(2) Subject to paragraph 3 of this article all space objects for which XY is the launching state according to Article I of the Convention on Registration of Objects Launched into Outer Space of 1974 shall be registered in the national register.

(3) If there are two or more launching States in respect of any such space object, the agreement among them according to Article II, paragraph 2 of the 1974 Convention shall determine which is to be the State of Registry for that particular space object.

(4) The following information should be entered into the national register:

- Name of the launching state or states (name of a private launching entity: natural or legal person),
- Registration number of the space object,
- Date and territory or location of the launch,
- Basic orbital parameters including nodal period, inclination, apogee and perigee,
- General function of the space object.

(5) Additional information and information in accordance with the 1974 Convention and/or the United Nations Registration Practice Resolution as specified in an implementing decree/regulation shall also be included in the national register.

(6) The information contained in paragraph 1 shall be made available to the Secretary-General of the United Nations as soon as possible.

(7) Any relevant change with regard to the information mentioned in paragraph 1 shall be registered in the national register. The Secretary-General of the United Nations shall be informed accordingly.

Article 11 – Liability and Recourse[3]

(1) When XY has paid compensation to third parties for damage caused by a space activity in fulfilment of its international obligations, the government is entitled to recourse against the operator.

(2) The recourse of the government against the operator may be limited to a certain amount.

[3] For a possible additional Article 11a the reader should refer to the committee report

Article 12 – Insurance

(1) The operator carrying out a space activity shall be insured to cover damage caused to third parties up to the amount of… (to be established by national law).

(2) The obligation of paragraph 1 does not apply when the government, acting as such, carries out a space activity.

(3) The authority may waive the obligation to insure when

b) The operator has sufficient equity capital to cover the amount of his/her liability;

c) The space activity is not a commercial space activity and is in the public interest.

(4) The details of the content and conditions of the insurance shall be laid down in implementing a decree/regulation to that effect.

Article 13 – Procedure

(1) The rules of procedure for the authority shall include time limits for the decision-making of the authority and the right to impose sanctions.

(2) Appropriate conditions, fees and tariffs shall be laid down by the authority in the implementing decree/regulation.

(3) Any dispute arising from the interpretation and/or application of the present law shall be resolved within the national jurisdiction or by agreement under the New Rules of the Permanent Court of Arbitration for Arbitration of Disputes relating to Outer Space Activities (2011).

Article 14 – Sanctions

Any breach of the obligations set out in this law shall be punishable with a fine not exceeding M in amount. The carrying out of space activities and the transfer of space activities without authorisation by the competent authority, granted pursuant to Articles 3 and 9, shall however be punishable with a fine not lower than N.

Annex II. Important documents concerning space object registration, representative national space register and Debris Mitigation Guideline

I. Registration Information Submission Form (as at 1 January 2010)

UNITED NATIONS REGISTER OF OBJECTS LAUNCHED INTO OUTER SPACE

Registration Information Submission Form (as at 1 January 2010)

Note: This form is available from http://www.unoosa.org/oosa/SORegister/resources.html. Please see annex for instructions and definitions. Completed forms should be sent by hardcopy through Permanent Missions to UNOOSA **and** electronically to soregister@unoosa.org.

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UNITED NATIONS REGISTER OF OBJECTS LAUNCHED INTO OUTER SPACE

Part A: Information provided in conformity with the Registration Convention or General Assembly resolution 1721 B (XVI)

New registration of space object	Yes ☐	Check box
Additional information for previously registered space object (see below for reference sources)	**Submitted under the Convention: ST/SG/SER.E/** ____	UN document number in which previous registration data was distributed to Member States
	Submitted under resolution 1721B: A/AC.105/INF. ____	

Launching State/States/international intergovernmental organization

State of registry or international intergovernmental organization		Under the Registration Convention, only one State of registry can exist for a space object. Please see annex.
Other launching States (where applicable. Please see attached notes.)		

Designator

Name		
COSPAR international designator (see below for reference sources)		
National designator/registration number as used by State of registry		

Date and territory or location of launch

Date of launch (hours, minutes, seconds optional)	dd/mm/yyyy hrs min sec	Coordinated Universal Time (UTC)
Territory or location of launch (see below for reference sources)		

Basic orbital parameters

Nodal period		minutes
Inclination		degrees
Apogee		kilometres
Perigee		kilometres

General function

General function of space object (If more space is required, please include text in a separate MSWord document)		

Change of status

Date of decay/reentry/deorbit (hours, minutes, seconds optional)	dd/mm/yyyy hrs min sec	Coordinated Universal Time (UTC)

Sources of information

UN registration documents	http://www.unoosa.org/oosa/SORegister/docsstatidx.html
COSPAR international designators	http://nssdc.gsfc.nasa.gov/spacewarn/
Global launch locations	http://www.unoosa.org/oosa/SORegister/resources.html
Online Index of Objects Launched into Outer Space	http://www.unoosa.org/oosa/oosaindex.html

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Part B: Additional information for use in the United Nations Register of Objects Launched into Outer Space, as recommended in General Assembly resolution 62/101		
Change of status in operations		
Date when space object is no longer functional (hours, minutes, seconds optional)	dd/mm/yyyy hrs min sec	Coordinated Universal Time (UTC)
Date when space object is moved to a disposal orbit (hours, minutes, seconds optional)	dd/mm/yyyy hrs min sec	Coordinated Universal Time (UTC)
Physical conditions when space object is moved to a disposal orbit (see COPUOS Space Debris Mitigation Guidelines)		
Basic orbital parameters		
Geostationary position (where applicable, planned/actual)		degrees East
Additional information		
Website:		

Part C: Information relating to the change of supervision of a space object, as recommended in General Assembly resolution 62/101		
Change of supervision of the space object		
Date of change in supervision (hours, minutes, seconds optional)	dd/mm/yyyy hrs min sec	Coordinated Universal Time (UTC)
Identity of the new owner or operator		
Change of orbital position		
Previous orbital position		degrees East
New orbital position		degrees East
Change of function of the space object		

Part D: Additional voluntary information for use in the United Nations Register of Objects Launched into Outer Space	
Basic information	
Space object owner or operator	
Launch vehicle	
Celestial body space object is orbiting (if not Earth, please specify)	
Other information (information that the State of registry may wish to furnish to the United Nations)	
Sources of information	
General Assembly resolution 62/101	http://www.unoosa.org/oosa/SORegister/resources.html
COPUOS Space Debris Mitigation Guidelines	http://www.unoosa.org/oosa/SORegister/resources.html
Texts of the Registration Convention and relevant resolutions	http://www.unoosa.org/oosa/SORegister/resources.html

Annex

Section A. Instructions for completing the form

1. Download the electronic version of the form from http://www.unoosa.org/oosa/SORegister/resources.html.
2. Reference sources and other resources for completion of the form are available from the above web-link.
3. Review definitions in Section B below and complete the form. If there are any queries, please e-mail soregister@unoosa.org.
4. The **completed hardcopy form** should be sent through official government channels to the relevant Permanent Mission to the United Nations (Vienna) to be formally transmitted to the United Nations.
5. The **completed electronic form** should be sent by the appropriate government entity to the United Nations Office for Outer Space Affairs using e-mail soregister@unoosa.org.

Section B. Definition of terms

Part A: Information provided in conformity with the Registration Convention or General Assembly resolution 1721B (XVI)

Launching State/States/international intergovernmental organization

State of registry/international intergovernmental organization: The State of registry is the launching State which carries the space object on its national registry of objects launched into outer space. The international intergovernmental organization is an organization which has declared its acceptance of the rights and obligations provided for in accordance with Article VII of the Registration Convention.

Note: In accordance with Article II of the Registration Convention, **only one State of registry can exist for a space object**. When more than one launching State exists, they should jointly determine which State should register the space object.

Other Launching States: As defined in the Registration Convention, "launching State" means:

(i) A State which launches or procures the launching of a space object;

(ii) A State from whose territory or facility a space object is launched;

Designator

Name: The common name/names used to identify the space object.

COSPAR international designator: Alphanumeric designator established by the Committee on Space Research (COSPAR) for space objects that successfully reach Earth orbit or beyond. The SPACEWARN Bulletin (available at http://nssdc.gsfc.nasa.gov/spacewarn) confirms the designators assigned by the World Warning Agency for Satellites on behalf of COSPAR. The designator can also be obtained from the Online Index of Objects Launched into Outer Space at http://www.unoosa.org/oosa/oosoindex.html.

National designator/ registration number: Designator or registration number assigned to a space object by the State of registry.

Date and territory or location of launch

Date of launch: The date of launch of the space object using Coordinated Universal Time (UTC) (also referred to as Greenwich Mean Time (GMT)).

Territory or location of launch: The territory or location of the launch of the space object. For a table of global launch locations, see http://www.unoosa.org/oosa/SORegister/resources.html.

Basic orbital parameters: Basic data on the space object's orbit around the Earth or a celestial body such as the Sun, Moon, etc. If object is orbiting a body other than Earth, please specify. The parameters are:

Nodal period: Time taken by the space object to complete one revolution around the body it is orbiting.

Inclination: The angle relative to the equator of the Earth or celestial body the space object is orbiting. Measured counter-clockwise from the equator.

Apogee: The furthest distance in the space object's orbit from the surface of the body it is orbiting.

Perigee: The closest distance in the space object's orbit from the surface of the body it is orbiting.

General function:	General information on the space object. Can include mission objectives, frequency plans, etc. If required, please attach text in a separate page.
Change of Status:	The date of the space object's decay, reentry, recovery, deorbit or landing.

Part B: Additional information for use in the United Nations Register of Objects Launched into Outer Space, as recommended in General Assembly resolution 62/101

Change of status in operations

Date when space object is no longer functional:	The date using Coordinated Universal Time (UTC) (also referred to as Greenwich Mean Time (GMT)) when the space object ceases to perform operational functions for the State of registry.
Date when space object is moved to a disposal orbit:	The date using Coordinated Universal Time (UTC) when the space object is moved into a disposal orbit. See COPUOS Space Debris Mitigation Guidelines for recommendations on disposal orbits, http://www.unoosa.org/oosa/SORegister/resources.html.
Physical conditions when space object is moved to a disposal orbit:	The physical conditions when the space object is moved into a disposal orbit. Conditions can include the change in orbit (e.g. +300 km above GSO), passivation of the space object and other measures as recommended in the COPUOS Space Debris Mitigation Guidelines.

Basic orbital parameters

Geostationary position:	Applicable only to space objects in the geostationary orbit. Planned and/or actual location of space object in ± degrees East along the equator from the Greenwich meridian (e.g. for 10.5 degrees West, use -10.5 degrees East).

Additional Information

Website:	Address on the World Wide Web for information on the space object/mission/operator.

Part C: Information relating to the change of supervision of a space object, as recommended in General Assembly resolution 62/101

Change of supervision of the space object

Date of change in supervision:	The date using Coordinated Universal Time (UTC) (also referred to as Greenwich Mean Time (GMT)) when the new owner or operator takes supervision of the space object.
Identity of the new owner or operator:	The identity of the new owner or operator of the space object.

Change of orbital position in the geostationary orbit

Previous orbital position:	The previous operational location of the space object in ± degrees East along the equator from the Greenwich meridian.
New orbital position:	The new operational location of the space object in ± degrees East along the equator from the Greenwich meridian.
Change of function of the space object:	The function of the space object following change in supervision.

Part D: Additional voluntary information for use in the United Nations Register of Objects Launched into Outer Space

Basic information

Space object owner or operator:	The entity that owns or operates the space object.
Launch vehicle:	The launch vehicle used to launch the space object into Earth orbit or beyond.
Celestial body space object is orbiting:	The body that the space object is in orbit around, if not Earth (i.e. the Moon, the Sun, Mars, Jupiter, etc.).
Other information:	Information relating to the space object that the State of registry may wish to furnish to the United Nations.

I. Registration Form of Space Objects of the United Kingdom

A brief illustration by the author: no registration form of space objects has been published by the relevant administration of the United Kingdom, however, the UK Space Agency announces the Registry regularly for the purpose of complying with international obligations and section 7 of the Outer Space Act 1986. The main items for registering space objects required by the UK can be summarized from the UK Registry.

Owner/Operator:

Date of launch:
Location of launch:

Designation:
Catalogue Number:

Nodal period:
Inclination:
Apogee:
Perigee:
Orbital position:

General function:
Notified to the UN:

Disposed or decayed:
Disposal Notified to the UN:

Accepted onto UK Register of Space Objects:
Licence issued under the Outer Space Act 1986:

Additional information:

II. The 2007 Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space

Endorsed by the UN General Assembly: 22 December 2007

UN Doc. A/62/20, Annex

Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space

1. Background

Since the Committee on the Peaceful Uses of Outer Space published its Technical Report on Space Debris in 1999,[1] it has been a common understanding that the current space debris environment poses a risk to spacecraft in Earth orbit. For the purpose of this document, space debris is defined as all man-made objects, including fragments and elements thereof, in Earth orbit or re-entering the atmosphere, that are non-functional. As the population of debris continues to grow, the probability of collisions that could lead to potential damage will consequently increase. In addition, there is also the risk of damage on the ground, if debris survives Earth's atmospheric re-entry. The prompt implementation of appropriate debris mitigation measures is therefore considered a prudent and necessary step towards preserving the outer space environment for future generations.

Historically, the primary sources of space debris in Earth orbits have been (*a*) accidental and intentional break-ups which produce long-lived debris and (*b*) debris released intentionally during the operation of launch vehicle orbital stages and spacecraft. In the future, fragments generated by collisions are expected to be a significant source of space debris.

Space debris mitigation measures can be divided into two broad categories: those that curtail the generation of potentially harmful space debris in the near term and those that limit their generation over the longer term. The former involves the curtailment of the production of mission-related space debris and the avoidance of break-ups. The latter concerns end-of-life procedures that remove decommissioned spacecraft and launch vehicle orbital stages from regions populated by operational spacecraft.

2. Rationale

The implementation of space debris mitigation measures is recommended since some space debris has the potential to damage spacecraft, leading to loss of mission, or loss of life in the case of manned spacecraft. For manned flight orbits, space debris mitigation measures are highly relevant due to crew safety implications.

A set of mitigation guidelines has been developed by the Inter-Agency Space Debris Coordination Committee (IADC), reflecting the fundamental mitigation elements of a series of existing practices, standards, codes and handbooks developed by a number of national and international organizations. The Committee on the Peaceful Uses of Outer

[1] United Nations publication, Sales No. E.99.I.17.

Space acknowledges the benefit of a set of high-level qualitative guidelines, having wider acceptance among the global space community. The Working Group on Space Debris was therefore established (by the Scientific and Technical Subcommittee of the Committee) to develop a set of recommended guidelines based on the technical content and the basic definitions of the IADC space debris mitigation guidelines, and taking into consideration the United Nations treaties and principles on outer space.

3. Application

Member States and international organizations should voluntarily take measures, through national mechanisms or through their own applicable mechanisms, to ensure that these guidelines are implemented, to the greatest extent feasible, through space debris mitigation practices and procedures.

These guidelines are applicable to mission planning and the operation of newly designed spacecraft and orbital stages and, if possible, to existing ones. They are not legally binding under international law.

It is also recognized that exceptions to the implementation of individual guidelines or elements thereof may be justified, for example, by the provisions of the United Nations treaties and principles on outer space.

4. Space debris mitigation guidelines

The following guidelines should be considered for the mission planning, design, manufacture and operational (launch, mission and disposal) phases of spacecraft and launch vehicle orbital stages:

Guideline 1: Limit debris released during normal operations

Space systems should be designed not to release debris during normal operations. If this is not feasible, the effect of any release of debris on the outer space environment should be minimized.

During the early decades of the space age, launch vehicle and spacecraft designers permitted the intentional release of numerous mission-related objects into Earth orbit, including, among other things, sensor covers, separation mechanisms and deployment articles. Dedicated design efforts, prompted by the recognition of the threat posed by such objects, have proved effective in reducing this source of space debris.

Guideline 2: Minimize the potential for break-ups during operational phases

Spacecraft and launch vehicle orbital stages should be designed to avoid failure modes which may lead to accidental break-ups. In cases where a condition leading to such a failure is detected, disposal and passivation measures should be planned and executed to avoid break-ups.

Historically, some break-ups have been caused by space system malfunctions, such as catastrophic failures of propulsion and power systems. By incorporating potential break-up scenarios in failure mode analysis, the probability of these catastrophic events can be reduced.

Guideline 3: Limit the probability of accidental collision in orbit

In developing the design and mission profile of spacecraft and launch vehicle stages, the probability of accidental collision with known objects during the system's launch phase and orbital lifetime should be estimated and limited. If available orbital data indicate a potential collision, adjustment of the launch time or an on-orbit avoidance manoeuvre should be considered.

Some accidental collisions have already been identified. Numerous studies indicate that, as the number and mass of space debris increase, the primary source of new space debris is likely to be from collisions. Collision avoidance procedures have already been adopted by some member States and international organizations.

Guideline 4: Avoid intentional destruction and other harmful activities

Recognizing that an increased risk of collision could pose a threat to space operations, the intentional destruction of any on-orbit spacecraft and launch vehicle orbital stages or other harmful activities that generate long-lived debris should be avoided. When intentional break-ups are necessary, they should be conducted at sufficiently low altitudes to limit the orbital lifetime of resulting fragments.

Guideline 5: Minimize potential for post-mission break-ups resulting from stored energy

In order to limit the risk to other spacecraft and launch vehicle orbital stages from accidental break-ups, all on-board sources of stored energy should be depleted or made safe when they are no longer required for mission operations or post-mission disposal.

By far the largest percentage of the catalogued space debris population originated from the fragmentation of spacecraft and launch vehicle orbital stages. The majority of those break-ups were unintentional, many arising from the abandonment of spacecraft and launch vehicle orbital stages with significant amounts of stored energy. The most effective mitigation measures have been the passivation of spacecraft and launch vehicle orbital stages at the end of their mission. Passivation requires the removal of all forms of stored energy, including residual propellants and compressed fluids and the discharge of electrical storage devices.

Guideline 6: Limit the long-term presence of spacecraft and launch vehicle orbital stages in the low-Earth orbit (LEO) region after the end of their mission

Spacecraft and launch vehicle orbital stages that have terminated their operational phases in orbits that pass through the LEO region should be removed from orbit in a controlled fashion. If this is not possible, they should be disposed of in orbits that avoid their long-term presence in the LEO region.

When making determinations regarding potential solutions for removing objects from LEO, due consideration should be given to ensuring that debris that survives to reach the surface of the Earth does not pose an undue risk to people or property, including through environmental pollution caused by hazardous substances.

Guideline 7: Limit the long-term interference of spacecraft and launch vehicle orbital stages with the geosynchronous Earth orbit (GEO) region after the end of their mission

Spacecraft and launch vehicle orbital stages that have terminated their operational phases in orbits that pass through the GEO region should be left in orbits that avoid their long-term interference with the GEO region.

For space objects in or near the GEO region, the potential for future collisions can be reduced by leaving objects at the end of their mission in an orbit above the GEO region such that they will not interfere with, or return to, the GEO region.

5. Updates

Research by Member States and international organizations in the area of space debris should continue in a spirit of international cooperation to maximize the benefits of space debris mitigation initiatives. This document will be reviewed and may be revised, as warranted, in the light of new findings.

6. Reference

The reference version of the IADC space debris mitigation guidelines at the time of the publication of this document is contained in the annex to document A/AC.105/C.1/L.260.

For more in-depth descriptions and recommendations pertaining to space debris mitigation measures, Member States and international organizations may refer to the latest version of the IADC space debris mitigation guidelines and other supporting documents, which can be found on the IADC website (www.iadc-online.org).

Annex III. Legal Documents Concerning Chinese Space Activities

A brief illustration by the author: there is no official English translation of the 2001 “Measures” and 2002 “Interim Measures” contained in this Annex III, the documents applied here are cited from an academical translation which was published in the Journal of Space Law (33) 2007, pp. 438-448.

I. Measures for the Administration of Registration of Objects Launched into Outer Space

Order No. 6 of the Commission of Science, Technology, and Industry for National Defense and the Ministry of Foreign Affairs of the People’s Republic of China
8 February 2001

Art.1 These Measures are formulated for the purpose of strengthening the administration of outer space activities, establishing national registry of space objects, protecting the legitimate interests of China as a launching State of space objects, effectively fulfilling the obligations of a contracting State of the Convention on Registration of Objects Launched into Outer Space.

Art.2 For the purpose of these measures, the term "space object" refers to an artificial satellite, crewed spacecraft, space probe, space station, launch vehicle and parts of thereof, and other human-made objects launched into outer space.

The Sounding Rocket and Ballistic Missile that temporarily crosses outer space shall not be regarded as a "space object."

Art.3 These measures shall apply to all the space objects launched in the territory of China, and the space objects jointly launched abroad by China and other States. The term "launching State" means a State which launches or procures the launching of a space object, and a State from whose territory or facility a space object is launched.

Art.4 China carries out the system of registering space objects. All government departments, juridical persons, other organizations and natural persons which launch or procure the launching of a space object shall have the obligation to register the space object in accordance with these Measures.

Art.5 The Commission of Science Technology and Industry for National Defense (Hereinafter referred to as the COSTIND) shall take charge of the administration of national registration of space objects and the Department of International Cooperation shall be responsible for routine work.

For the national registration involving other joint launching States, the COSTIND, if necessary, after consultation with the

Ministry of Foreign Affairs, determines which one of them shall register the space object.

Art.6 China establishes and maintains a National Register. The information in the National Register shall mainly include: registration number, registrant, owner of the space object, an appropriate designator of the space object, basic characters of the space object, launching enterprise of the space object, name of the launch vehicle, date and territory or location of launch, basic orbital parameters of the space object, and the status of the launching and orbiting of the space object.

See Annex: Form of National Registration of Space Objects.

Art. 7 Subject to the provisions of Article VIII of these Measures, the owner of a space object shall register the space object in the national register. Where there are more than one owners of a space object, the main owner shall register the space object on behalf of all the owners.

The launching enterprise of a space object shall provide necessary assistance in the national registration of such a space object.

Art. 8 Where a space object launched from the territory of China is owned by the government, juridical persons, organizations or natural persons of the State other than China, the corporation which provides the international launching service of the space object shall register it at national registry.

Art. 9 The registrant of a space object referred in Article 7 and Article 8 shall furnish registration information to the COSTIND and complete the registration formalities within sixty days in accordance with Article 6 after the space object has entered the space orbit

When major changes (e.g. change of orbit, break up, cease working or reentry into atmosphere) of the conditions of the space object registered in accordance with these measures occur, the registrant of the space object shall amend the information of the registration within sixty days after the conditions of the space object have been exchanged.

Art.10 The National Register specifically includes sections for Hong Kong and Macau. The specific measures for the regis-

tration of space objects which owned or launched by Hong Kong Special Administrative Region and Macau Special Administrative Region shall be instituted separately.

Art.11 The COSTIND shall maintain the National Register. With the permission of the COSTIND, the relevant government departments and juridical persons, other organizations and natural persons under the authorization of the competent governmental departments may apply to the keeper of the National Register for access to the information in this Register.

Art.12 A space object shall be registered internationally in accordance with the Registration Convention by the COSTIND, via the Ministry of Foreign Affairs within sixty days after the national registration of the space object, at the Secretariat of the United Nations.

Art. 13 According to Article IV(1) of the Registration Convention, the following information concerning each space object carried on its registry: name of launching State or States, an appropriate designator of the space object or its registration number, date and territory or location of launch, basic orbital parameters and general function of the space object, shall be included in international registration.

Art.14 For the international registration of a space object jointly launched by China and other States, the State of Registry shall be determined by the Ministry of Foreign Affairs after consultation with concerned States in accordance with the Registration Convention.

Art.15 The provisions of these Measures related to national registry shall be interpreted by the COSTIND; the provisions related to the Registration Convention and international registry shall be interpreted by the Ministry of Foreign Affairs.

Art. 16 These Measures shall enter into force upon the date of promulgation.

II. Interim Measures on the Administration of Licensing the Project of Launching Civil Space Objects

"The Interim Measures on the Administration of licensing the Project of Launching Civil Space Objects" is now issued and comes into effect on December 21, 2002.

Minister of COSTIND: Jibin Liu
November 21, 2002

CHAPTER I GENERAL PROVISIONS

Article 1 The present measures are formulated with a view to regulating the administration of the project of launching civil space objects, promoting the sound development of the civil space industry, maintaining national security and the public interests, and fulfilling the obligations of China as a contracting State to the international outer space conventions.

Article 2 For the purpose of these measures, the term "project of launching civil space objects" (hereinafter referred to as "project") means the launch of a spacecraft such as a satellite from the territory of China into outer space for non-military purpose, and the launch of such a spacecraft into outer space from outside of the territory of China while the spacecraft is owned by, or the ownership of the spacecraft has been transferred on-orbit to, the persons, natural or juridical, or the organizations of the People's Republic of China.

Article 3 The administration system of licensing shall apply to the project. Any persons, natural or juridical, or organizations undertaking such a launch project shall, in accordance with the present measures, apply for examination and approval, and shall not carry out the project until he/it is found to be qualified upon examination and has obtained a license for the project.

Article 4 The Commission of Science, Technology, and Industry for National Defense (hereinafter referred to as "the COSTIND") shall plan and administrate the project, and shall be responsible for examining, approving and supervising the project.

CHAPTER II APPLICATION, EVALUATION AND AUTHORIZATION PROCEDURES

Article 5 The general project contractor shall be the applicant for a license. Where there is no domestic general project contractor, the final owner of the satellite or other spacecraft shall be the applicant for the license.

The applicant for a license is required:

(a) to abide by the laws and regulations of China, and maintain the national secrets;

(b) not to endanger the national security; damage the national interests; or violate the national diplomatic policies or the international conventions to which China is a State Party, by the project under application;

(c) not to cause irremediable danger to public health, safety, or properties by the project under application, due to major negligence or intentional acts;

(d) to have the relevant approved documents issued by the competent state departments for carrying out the project under application;

(e) to have technical staff, financial means, and technology information needed for carrying out the project under application;

(f) to meet other requirements provided by laws, regulations, or rules.

Article 6 The applicant shall, nine months prior to the scheduled launch of the project, submit the following documents (in triplicate) to the COSTIND:

(a) an application form for a project license and documents on the qualifications of the applicant for evaluation;

(b) the relevant documents proving that the project conforms to national laws and regulations on environmental protection;

(c) for a project being executed in a domestic launching site, the following information shall be provided: the scheduled time for launch; the technical requirements for the satellite; the launching vehicle and the communication system for launch, observation, and control; the detailed orbital parameters of the launching vehicle; the survey report on the landing area or recovering place; and the documents on detailed orbital parameters of the satellite and the use of frequency resources;

for a project being executed at a foreign launching site, copies of the legal documents on orbital parameters, of the launching vehicle and the satellite, and copies of the documents permitting the use of the relevant frequency resources shall be provided;

a Chinese satellite launch enterprise shall provide a copy of the "Radio Station License of the People's Republic of China" issued by the Ministry of Information Industry for the radio station in outer space;

(d) the safety design report relating to the project and documents relating to public security; supplementary documents concerning the reliability of key safety system, the affects of the launching vehicle, either in normal condition or malfunction during the launch, to the property and personal safety near the launching site and within the range of the launch track, the prevention from pollution and space debris, and other relevant safety; for a foreign-involved project, the documents concerning policy evaluation, confidentiality and security evaluation must also be submitted.

Article 7 The COSTIND shall, within thirty days as of receipt of the application documents, examine the project under application, and issue a license where the requirements are met. Otherwise, no license shall be issued. The applicant and the relevant departments shall be so notified in writing.

Article 8 Where the applicant challenges the conclusion from evaluation, it may apply to the COSTIND for re-evaluation or administrative review in accordance with the law.

Article 9 The relevant evaluation of a foreign-involved project must be carried out by a foreign trade company designated by the Chinese government, and the contract on such a project shall not enter into force until it is authorized by the COSTIND.

CHAPTER III SUPERVISION AND ADMINISTRATION

Article 10 A license shall mainly contain:

(a) the applicant and its legal representative;

(b) the registered address (the applicant's domicile);

(c) main contents of the project;

(d) the scheduled time for launch;

(e) the expiration date of the license;

(f) the organ issuing the license and the time of issuance.

Article 11 The license shall be limited to an authorized project, and shall be automatically terminated after the completion of the project.

Article 12 A license shall not be altered or transferred.

Article 13 Where any content in a license needs to be modified, the licensee shall, ninety days prior to the expiry of the license, file an application to the COSTIND for modification. The license shall not be modified until the modification has been approved upon examination.

Article 14 With respect to a project under planned cancellation, the licensee shall, ninety days prior to the expiry of the license, apply to the COSTIND for cancellation, and the license shall be nullified upon approval.

Article 15 With respect to a project that is impossible to be accomplished due to inappropriate management of the licensee, the COSTIND shall nullify the project license.

Article 16 The COSTIND shall order the licensee to rectify within a time limit, or withdraw the license in a severe case if the licensee:

(a) violates the relevant national laws or regulations or the agreement between China and other states on maintaining confidentiality during execution of the project;

(b) conducts any actions, during execution of the project, endangering national security; damaging national interests; or violating national diplomatic policies or international conventions to which China is a State Party;

(c) carries out the launch activities beyond the limit approved by the license;

(d) conducts other actions in violation of the present measures.

Article 17 With respect to a project for which the license is withdrawn, the applicant for the project shall not, within two years as of the withdrawal, file a second application for a license regarding the same project.

Article 18 Where, due to a licensee's actions, any content of the project is changed, or the project is delayed or cancelled, thus resulting in expenses in relevant aspects, the corresponding liability and the expenses to be borne shall be clarified in the contract by the licensee and the concerned parties.

Article 19 A licensee must comply with the relevant national regulations to insure himself against liability incurred in respect to damage or loss suffered by third parties and against other liability incurred by launching a space object.

Article 20 For a project being executed in a domestic launching site, the licensee shall, six months prior to the scheduled launch, report the launching plan of the project to the COSTIND.

The licensee shall, before commencing the working phase in a launching site, file an application to the COSTIND for approval to release the project from the factory, and provide:

(a) documents on technical conditions of the launching vehicle, quality control, flight test outline, security and confidentiality, and other required documents;

(b) copies of the effective insurance policy of third party liability for the project, copies of the relevant documents (in triplicate), and copies of the relevant effective insurance policies (in triplicate). In exceptional circumstances, written documents shall be provided to the COSTIND and shall be dealt with specifically.

The working phase in a launching site of the project shall not commence until it has been approved.

Article 21 For a project being executed in a foreign launching site, the licensee shall, sixty days prior to the scheduled date for launch, file an application to the COSTIND for approval to release the project from the factory, and attach copies of the final documents (in triplicate) legally binding in respect of the liability insurance for third parties, the relevant insurances, security, confidentiality, etc., and shall not continue carrying out the project until it has been approved.

Article 22 A licensee must, within one month after the completion of a launch project, report to the COSTIND in writing on the accomplishment of the project.

Article 23 The COSTIND shall supervise and irregularly inspect the carrying out of the approved projects, and the authorized officials shall have the right to be present and inspect the relevant activities during the carrying out of the project.

CHAPTER IV LEGAL RESPONSIBILITY

Article 24 A licensee shall have administrative penalties imposed in accordance with the law if he conceals the truth, practices frauds or damages the national interests during application or carrying out of the project. A licensee shall be held criminally responsible in accordance with the law if he commits a crime.

Article 25 If any person, natural or juridical, or any organization undertakes an unauthorized project without a license, the COSTIND shall order the cessation of the illegal activities. Persons or organizations so involved shall have administrative

penalties imposed in accordance with the law, or, if they commit a crime, shall be held criminally responsible in accordance with the law.

Article 26 An organ or an official, which examines the applications for licenses, and neglects its/his/her duties or abuses its/his/her powers during the examination and approval of applications, thus causing loss to the People's Republic of China, shall have administrative sanctions imposed, or shall be held criminally responsible in accordance with the law if it/he/she commits a crime.

CHAPTER V SUPPLEMENTARY PROVISIONS

Article 27 The competent authorities to interpret the present measures shall remain with the COSTIND.

Article 28 The present measures shall enter into force on December 21, 2002.

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