Studies on the Establishment of National Mechanism on Space Debris Mitigation

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Introduction

Space debris mitigation has become an international custom for international space activities. COPUOS adopted the Guideline on Space Debris Mitigation. The Guideline provided that member states or international organization shall establish a national mechanism to mitigate space debris. China has made progress in legislation on space activities and management system. In order to establish a national mechanism on space debris mitigation, it is essential for China to promote legislation on space activities and specify the duties of management administrates.

This paper includes four parts. The first part analyse the necessity of establishment of national mechanism on space debris mitigation. The part thinks the obligations from international space treaties and international custom make it necessary to establish national mechanism on space debris mitigation.

The second part studies what the national mechanism on space debris mitigation is and what the constructive elements of the national mechanism on space debris mitigation are. The part summarized seven parts to establish the national mechanism on space debris mitigation.

Based on the seven parts on the national mechanism on space debris mitigation , The third part outlined the existing national mechanism on space debris mitigation in China, provied some suggestions for chinese government to develop the national mechanism on space debris mitigation.

Ⅰ. Necessity for Establishment of National Mechanism on Space

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Debris Mitigation

1. Establishment of National Mechanism on Space Debris Mitigation is the Requirement under Guidelines on Space Debris Mitigation

Pursuant to Guidelines on Space Debris Mitigation adopted by UN COPUOS on June, 2007, 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. [2]It is reflected by statistics that by June 16th 2007, the number of traceable objects that were under observation in earth orbit amounted to 12202, among which the payloads and space debris came up to 3270 and 8910 respectively.

Space debris poses enormous threat to human space activities mainly in the following two ways: one is the looming menace that space debris may collide with functional space objects. Space debris is considered as the "killer of satellites, spacecrafts and space shuttles". To illustrate, on June 24th 1996, the French electromagnetic reconnaissance satellite Cherry was hit by 10-year ago-formed wreckage of rocket Ariane (No.18208 space debris); in 2000, space shuttle Discovery was hit by space debris for 38 times during its 13-day docking mission on international space station and so as the space shuttle Endeavour, which was hit for 30 times during its 11-day flight. [3]The other threat is the harmful consequence that space debris may bring about to space environment. This type of threat principally denotes the phenomenon that a mass of space debris in low earth orbit and geostationary orbit lead to the change in composition of these two orbits and thus affect their normal exploitation. This threat also refers to environmental pollution in space and atmosphere that hazardous space debris brings about. For example, on January 24th 1978, a Soviet nuclear-powered satellite Cosmos 954 disintegrated above Canada's territory, subsequent to which the radioactive debris from the satellite, with an onboard nuclear reactor of 30kg enriched uranium, was deposited on Canadian territory on an 800-kilometre path. In an attempt to remove all the radioactive material, Canadian government spent as much as 14 million us dollars. This accident aroused dispute between Soviet and Canada, which was finally ended up with Soviet paying compensation to Canada for Canada's recovery effort.

In order to eliminate huge threat that space debris imposed on human space activities, International community has been making great efforts to strengthen the management and mitigation of space debris. In 1993, NASA, ESA, Russia and Japan initiated establishment of Inter-Agency Space Debris Coordination Committee (hereinafter IADC) in managing space debris. The purpose of IADC is to encourage the exchange of information on space debris research among the space agencies of its

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[2] UN document A / 62 / 20: Report of the Committee on the Peaceful Uses of Outer Space (Annex: Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space), http://www.unoosa.org/pdf/gadocs/A_62_20C.pdf, viewed on July 16, 2008.

[3] Du Heng, Zhang Wenxiang: Space Debris, China Aerospace Press, 2007 ed., p.12.

member states, to scrutinize the progress of ongoing cooperative activities, to promote cooperative chances on space debris research, and to find solutions in mitigating space debris. China officially joined IADC in 1995. By now, IADC has had 11 member states, almost all of which are the leading space powers in the world.

In April 2002, the 20th IADC Meeting adopted IADC Space Debris Mitigation Guidelines and 11 space agencies of member states signed this document. Guidelines require member states, by formulating relevant policies, to guarantee effective control on production of space debris in their future space activities, and also require that "when an organization planning and operating its space system, it shall take systematic action as early as on the mission requirement analysis and definition phases. By introducing the space debris mitigation measures into the life cycle of space systems can contribute to the reduction of adverse impact that space debris may cause on orbital environment."

Besides, the UN Scientific and Technical Subcommittee decided on December, 2004 to establish the Working Group on Space Debris, responsible for developing a set of guidelines on space debris mitigation. After that, on its 44th session, the subcommittee adopted Space Debris Mitigation Guidelines presented by the Working Group on Space Debris. Pursuant to the Session resolution, "it has been a common understanding that the current space debris environment poses a risk to spacecraft in Earth orbit. .....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."[4]In June, 2007, COPUOS adopted Guidelines presented by Scientific and Technical Subcommittee. Guidelines clearly requires: "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."[5]

Although absent of legally binding force, Guidelines exerted wide range of political influences. Some states have already voluntarily implemented space debris mitigation measures on the basis of Guidelines. As a responsible space power, China also shall make positive response to the requirements under Guidelines, in compliance with which establishing the national mechanism on space debris mitigation as soon as possible, and establishment of such mechanism is undoubtedly of great practical significance for China.

2. Establishment of National Mechanism on Space Debris Mitigation is the Requirement under Fulfillment of Customary International Obligations

[4] UN Document A/AC.105/890: Report of the Scientific and Technical Subcommittee on its forty-fourth session, held in Vienna from 12 to 23 February 2007. http://www.unoosa.org/pdf/reports/ac105/AC105_890C.pdf, viewed on July 12, 2008.

[5] UN Document A/62/20: Report of the Committee on the Peaceful Uses of Outer Space (Annex: Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space), http://www.unoosa.org/pdf/gadocs/A_62_20C.pdf, viewed on July 16, 2008

Space debris mitigation, in terms of space activities, has already become one of norms of international customary law. Pursuant to Article 38 of Statute of International Court of Justice, there are two constitutive elements for international custom----being accepted as law and being generally practiced by states. Apparently, as contemporary international space practice shows, almost all the states consider the space debris mitigation a certain legal obligation, and mitigation has been generally carried out by these states in their national space activities.

With respect to legal obligation issue, after COPUOS adopting Space Debris Mitigation Guidelines, most of the states officially declared observance of obligations under the Guidelines, which meant those states realized that they were imposed certain duties in mitigating space debris. On December 8th, 2005, the General Assembly resolution 60/99 reflected once again the consensus from international community on the obligation of space debris mitigation.[6]

With regard to international practice issue, as an outcome of unremitting endeavor of Inter-Agency Space Debris Coordination Committee, an entity that is composed of 12 states, the Space Debris Mitigation Guidelines are exactly the state practices when those states fulfilling their mitigation obligations. Besides, relevant national legislations also fully represented that such state practice on space debris mitigation finally contributed to the formation of international customary law in this regard.

Therefore, under the requirement of international customary law, China, as an emerging and responsible space power, is obligated to take measures on space debris mitigation by establishing national mechanism on this issue.

Ⅱ. Status Quo and Problems of National Mechanism on Space Debris Mitigation in China

Neither the existing provisions of international law nor international space treaties clearly define what national mechanism for space debris mitigation is or propose any specific requirement regarding how to establish national mechanism. According to relevant state practices on this issue, national mechanism for space debris mitigation is to be established mainly from these two aspects.

On the one hand, national administration mechanisms for space debris management shall be set up, inasmuch as institutional development is the core for national mechanisms. Effective, efficient and scientific institutions guarantee the implementation and supervision of space debris management. At present, major space powers all have such type of management organizations, responsible for implementing and supervising the implementation of national policies on space debris management. For example, US NASA, US Department of Commerce, US Ministry of Communications, US Federal Communications Commission and Russia Aeronautics

[6] Paragraph 27 of Resolution 60/99 adopted by the General Assembly on December 8, 2005: "the General Assembly considers that it is essential that Member States pay more attention to the problem of collisions of space objects, calls for the continuation of national research on this question and agrees that international cooperation is needed to expand appropriate and affordable strategies to minimize the impact of space debris on future space missions.

and Space Administrations explicitly provide in domestic space laws their functions on management of space activities, including the management and supervision over space debris.

On the other hand, comprehensive national mechanisms for space debris mitigation also require a complete and systemized set of laws and regulations, which means that states shall transform the Guidelines into domestic laws, or into domestic policies, or at least into domestic industry standard, so that all the mitigation measures will be thoroughly undertaken within the states. Taking US as an example, its regulations governing space debris mitigation include 1858 National Aeronautic and Space Law, 2006 National Space Policy and 2001 US Government Orbital Debris Mitigation Standard Practice Norms and Guideline for Limiting Orbital Debris and Assessment Procedures, etc..

As a member state of IADC and a space power in the world, China has actively participated in IADC's and COPUOS' preparation work for Guidelines and other international instruments. Meanwhile, China has also launched relevant projects on the establishment of national mechanism for space debris mitigation.

In step with the construction of national mechanism for space debris mitigation, China has initiated projects on building up debris mitigation-related legal and administrative system. First, under the unified leadership of National Space Agency, interested divisions worked out Space Debris Implementation Plan 2006-2010, furthering the significance of space debris mitigation from policy level to the real protection of space environment. Next, during the Tenth Five-Year Plan, China has embarked on prescribing space debris mitigation standards which can fully reflect our national conditions and characters. In Standard System Form of National Defense Industry, it proposed partial standard projects on space debris technique. In June 2005, China officially issued Space Debris Mitigation Requirements (with guideline nature) under Aerospace Industry Standard QJ3221. Moreover, in 2006, the codification of Standard Framework System Table of Space Debris (the first edition) was completed. This System Table divided the space debris-related standards into three levels——general standards, management standards and technical standards. It laid out the expected level of response standards as well, such as international standards, national standards, industrial standards and enterprise standards.[7] Lastly, Bureau of Science and Technology and Industry of National Defense is now promoting national space legislation and the completion of Space Activities Management Regulations, with the purpose of carrying out space debris mitigation on legal aspect.

Compared with other state practices in debris mitigation, China still has to make improvement in the following areas:

First, the legal and policy systems of space debris mitigation need to be improved. Although the former Committee of Science and Technology and Industry of National Defense developed a number of policy criteria in this regard, there are still distinct limitations on the development of legal and policy systems relating space debris mitigation

[7] Zhang Wenxiang, "Advances in Research of Space Environment Protection", *Research on Space Debris*, 2007, 7, p.43.

For one thing, the level of relating legal and policy instruments shows inferior. Viewing from the current situation of existing regulations and policies, space activities still remains being regulated by administrative regulations and there is no specific space law, which is far from being commensurate with China's status as a leading space power. As to the management of space debris, even the lowest level of administrative regulations cannot be found, leaving only several documents without legally binding force and with limited political influence. Taking Space Debris Implementation Plan 2006-2010 as an example, it is just a government blue book with declaratory nature, without authorizing any institution or individual any right and obligation. From the national level, the State Council or NPC didn't issue any document, policy or law to regulate space debris mitigation measures.

For the other, the soundness of legal and policy systems is insufficient. Laws and regulations play a fundamental role to define the basic principles of space debris mitigation, related management agencies as well as their functions and legal liabilities. Policies serve as means to further implement the legal obligations and to improve laws and regulations. Viewing from our existing legal and policy systems, on the level of laws and regulations relating to space debris mitigation, there are neither relevant laws which are promulgated by NPC nor regulations enacted by LPC, or by the State Council or other departments. As to the policy level, there is a lack of mandatory standard system as well as binding management policies.

Second, the administration system on space activities needs to be improved.

Space activities are with high-risk, high-tech and high-investment natures and need to be administered and supervised under the government. For that sake, various states established management agencies on space activities to strengthen their own management on national space activities or space activities carried out by their private entities, which is in strict accordance with Article 6 of Outer Space Treaty.[8]

Every state is different in its administration system on space activities. By taking US as an example, its administration agencies comprise NASA, Federal Communications Commission, Ministry of Communications, Department of Commerce and State Council, etc.. NASA is responsible for coordination of civil space activities and participation in international cooperation of space activities; Federal Communications Commission is in charge of distribution of satellite spectrum; Ministry of Communications licenses the launch. Each department has its corresponding agency to take charge of the management of space debris, including the implementation of mitigation measures.

In China, the existing administration agencies on space activities are Bureau of Science and Technology and Industry of National Defense, National Space Agency and General Reserve Department of PLA. In accordance with their respective

[8] Article 6 of Outer Space Treaty: "State Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty. The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty. When activities are carried on in outer space, including the Moon and other celestial bodies, by an international organization, responsibility for compliance with this Treaty shall be borne both by the international organization and by the States Parties to the Treaty participating in such organization."

statutory functions, the authority of Bureau of Science and Technology and Industry of National Defense, inherited from former Committee of Science and Technology and Industry of National Defense, is "drawing up policies and development plans for production and technology of nuclear, aerospace, aviation, shipping and weapon industries and implementing industry management; working out guidelines, policies, laws and regulations for national defense industry and converted industry from military technology to civil use; and developing rules on defense industry and trade management." Likewise, the function of National Space Agency is to "draft policies and regulations and formulate development programs, plans and industry standard." [9]It is not hard to tell that the aforementioned functions of these two agencies overlap with each other to great extent, especially on the management of space debris mitigation. For example, the standard of space debris mitigation both falls within the purview of "rules on defense industry and trade management" which are developed by Bureau of Science and Technology and Industry of National Defense and of "development programs, plans and industry standard" of National Space Agency. As a matter of fact, National Space Agency only exercises functions as organizing and coordinating the exchange and corporation on space activities between Chinese government and international organizations.

For the foregoing reasons, the top priority of China, when establishing national mechanism on space debris mitigation, goes to the topic on how to build up a scientific management system of space activities.

III. Establishment of Chinese National Mechanism on Space Debris Mitigation

The establishment of national mechanism on space debris mitigation requires guaranty and support of legal mechanism as well as specific agencies which are responsible for its implementation. And these two directions are where our government shall head for when establishing its own national mechanism.

For one thing, as to a set of complete and scientific laws and regulations governing space debris mitigation, Chinese government, at the very beginning, has to formulate and enact Space Law of PRC as soon as possible. As early as 1958, US had its Aerospace and Aviation Law. After that, Sweden issued Space Activities Law in 1982, UK issued Outer Space Law in 1986, Russia issued Space Activities Law in 1993, South Africa issued Space Affairs Law in 1993 (revised in 1995), Ukraine issued Space Activities Law in 1996, Australia issued Space Activities Law in 1998 (revised in 2001 and 2002) and Japan issued Law of National Space Development Agency in 1969. The legislations in these states not only promoted the development of their national space activities and related causes, but also greatly ensured that national space activities progressed within a normative framework.

As China's space technology and space activities are developing at a staggering rate, it is an irreversible trend for Chinese government to enact our own Space Law.

[9] "Main Functions of National Space Agency", http://www.cnsa.gov.cn/n615708/n620168/n620175/index.htm, viewed on July 12, 2008.

By doing this, we can assuredly achieve notable results on both sustained development of our space technology, as well as lawful and orderly progress of national space activities.

The introduction of Space Law of PRC plays a pivotal role in the establishment of national mechanism on space debris mitigation. For one thing, this law serves as a guidance and fundamental law for complete legal systems of space activities and space debris mitigation. For the other, the introduction of Space Law is the inevitable requisite and legal basis for clarifying certain authorities of management agencies on space activities, especially those who are in charge with space debris mitigation, and for establishing scientific and effective management mechanism.

However, legislation is a complicated and time-consuming task. Therefore, it is an urgent and realistic choice for Chinese government to first, speed up the introduction of National Standard on Space Debris Mitigation of PRC so as to implement Guidelines, and then enact policies to implement national standard on proper occasion, and finally establish a set of laws and regulations, including the development of Space Law.

Second, among national legislations of space debris mitigation, the related procedural rules and assessment rules, which are cornerstones for realizing standard rules, need to be further improved. This proposal is also supported by most state practices. For example, US enacted US Government Operating Norms on Orbital Debris Mitigation Standard in 2001. In 2007, US enacted NASA Procedural Documents on Limiting Space Debris, further clarifying the standard procedure on space debris mitigation. As to the assessment rules, US introduced a series of regulations such as Probabilistic Risk Assessment (PRA) Procedure on NASA Projects and Programs, and Guidelines and Assessment Procedure on Limiting Orbital Debris, etc. ESA also instituted European Rules of Conduct on Space Debris Mitigation and ESA Projects Requirement on Space Debris Mitigation. Besides, Russian introduced General Requirements on Man-Made Pollution Mitigation in Near-Earth Space (Russia Federation National Standard).

Last, concurrent with establishment of national legal system on space debris mitigation, the set up of early-warning and contingency handling mechanisms, in coping with the production and damage arising out of space debris, are of equal necessity. Such mechanisms are composed of relevant laws and policies in regulating space activities, preventing space debris from being generated and timely settling the pollution incidents happened in space. A number of states are now concentrating in establishing effective early-warning and contingency handling mechanisms in their related standard systems and legislations.

The early-warning mechanism mainly refers to the constitution of space debris monitoring and early-warning agencies, which dedicate to, in the long run, survey and catalogue space debris that are generated from national space activities, to provide analytical reports in a timely manner when those debris begin to change in state, to forecast the re-entry of potential harmful space objects and collisions, and to assess the possibility of the generation of space debris. The contingency handling mechanism mainly denotes how to deal with the emergency caused by space debris

and with the contingency relating to space debris mitigation.

For the other, Chinese government is supposed to establish a set of scientific management mechanism on space debris mitigation so as to clarify certain authorities on national management agencies in this regard.

The contemporary major space powers basically adopted management agencies to take charge of space activities and space debris. There are mainly two types of management systems of space activities: one is US type, i.e. decentralized management pattern. Specifically, NASA, Department of Commerce, Ministry of Communications and Federal Communications Commission are responsible for certain aspects of America's space activities, among which the military space activities fall within the jurisdiction of Department of National Defense. Likewise, the management of space debris is in the charge of relevant department.

The other type is Russia type, i.e. centralized management pattern. Pursuant to Russian Federal Space Activities Act, in February 1992, the Russian former president Boris Yeltsin ordered the establishment of Russian Space Agency, which is the management and implementation agency for civil-use space activities, and leads Russian space activities aiming to serve its national scientific development and economy, while its national defense and safety-oriented space activities are under the supervision of Department of National Defense. However, on January 20th, 1998, president Yeltsin issued another order, transferring the administration authority of military aerospace industry to Russian Space Agency which was previously with civilian nature, while the Department of National Defense turned to be a user. The purpose of this order was to maximize the economic benefits of aerospace industry by various means, among which this order passed on the administration authority of Russian military space activities, 38 military enterprises and 21 holding companies to Russian Space Agency. Since then, Russian Space Agency achieved a real trinity in managing military, civil and commercial space activities.[10]

Based on the aforementioned state practices, well defining our national management systems on space activities is the key to explicitly sort the national management system on space debris mitigation. Since there is a lack of Space Law of PRC and even an administrative regulation on space activities management, national agencies in this regard as well as their terms have been all along in a blurred state.

The management of space activities in China is in fact exercised by former Committee of Science and Technology and Industry of National Defense and the General Reserve Department of PLA. CSTIND is in charge of civil-use space activities and GRD is responsible for national defense and safety oriented space activities. However, these two agencies were insufficient in legal basis when exercising their functions, and especially after institutional reform of Large Department System in 2007, the relevant competencies of CSTIND was taken over by newly established Ministry of Industry and Information Technology, and such transformation still failed to provide convincing legal authorities for management of our national space activities and space debris. It is not difficult to discern that all these

[10]Shi Weiping, He Jiwei, "The Adjustment of Russia's Space Development Strategy and Management System", *China Aerospace*, 2000, 12.

previous chaotic situations erect tremendous barrier for the management task on space activities and space debris.

Therefore, Chinese government must bear in mind that in order to establish a scientific management mechanism on space debris mitigation, it has to, by legally defining the rights, obligations and tasks of management agencies on space debris mitigation, speed up the space legislation process, so that institutional and organizational guarantee and support can really be provided on the way of the establishment of scientific national mechanism on space debris mitigation.