United Nations Institute
for Disarmament Research

Government of the
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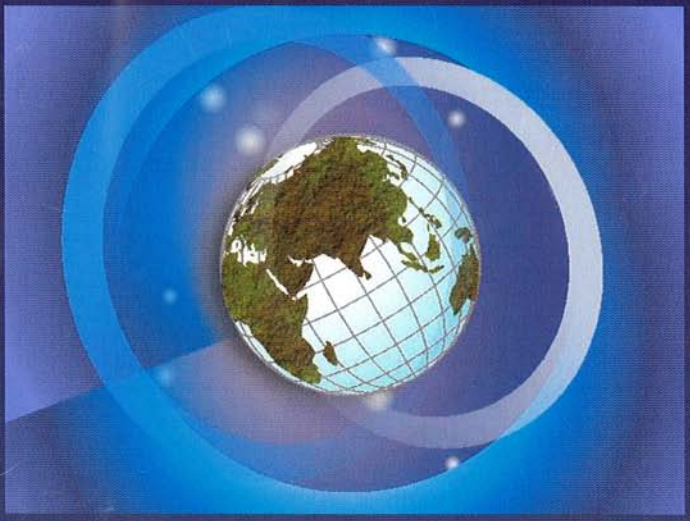
The Simons Foundation

Government of the
Russian Federation

Safeguarding Space Security: Prevention of an Arms Race in Outer Space

Conference Report
21-22 March 2005



UNITED NATIONS

UNIDIR/2006/1

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UNIDIR
United Nations Institute for Disarmament Research
Geneva, Switzerland

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UNIDIR/2006/1

UNITED NATIONS PUBLICATION
Sales No. GV.E.06.0.6
ISBN 92-9045-179-3

The United Nations Institute for Disarmament Research (UNIDIR)—an intergovernmental organization within the United Nations—conducts research on disarmament and security. UNIDIR is based in Geneva, Switzerland, the centre for bilateral and multilateral disarmament and non-proliferation negotiations, and home of the Conference on Disarmament. The Institute explores current issues pertaining to the variety of existing and future armaments, as well as global diplomacy and local tensions and conflicts. Working with researchers, diplomats, government officials, NGOs and other institutions since 1980, UNIDIR acts as a bridge between the research community and governments. UNIDIR's activities are funded by contributions from governments and donors foundations. The Institute's web site can be found at:

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PREFACE

The conference on "Safeguarding Space Security: Prevention of an Arms Race in Outer Space" is indeed timely. Over the years, much has been achieved in ensuring the use of outer space for the benefit of humankind. To mention only a few examples, the 1963 Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Underwater, the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (known as the Outer Space Treaty) and the 1975 Convention on Registration of Objects Launched into Outer Space are important milestones. Likewise, the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies and the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques are significant achievements in the ongoing efforts to reserve the use of outer space exclusively for peaceful and scientific purposes for the good of all.

Yet, while elements of an international legal framework have been put in place, the key problem of the prohibition of deployment of weapons in outer space has not been solved in a comprehensive manner. Prevention of an arms race in outer space—better known under its acronym PAROS—continues to be an urgent challenge. Despite important efforts, such as the joint Sino-Russian working paper in 2002, *Possible Elements for a Future International Legal Agreement on the Prevention of the Deployment of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects*, and notwithstanding the considerable support to an international agreement banning the weaponization of outer space, we have reached an impasse.

As Secretary-General of the Conference on Disarmament, I believe it is critically important that this body, drawing on its considerable knowledge and expertise, meets its responsibilities and starts considering the issue of PAROS. Indeed, at the high-level segment of the Conference on Disarmament that took place in March 2005, several high-level dignitaries stressed the importance and the urgency of preventing an arms race in outer space.

The political, economic and military significance of space continues to increase, involving a growing number of civil and military actors. The use of space for scientific research purposes has yielded unprecedented achievements and has provided the impetus for the development of technologies that benefit all of us. At the same time, space generates tens of billions of dollars in revenues for the private sector. As of 2005, space-based assets are rapidly becoming part of our critical national and international infrastructure. They are indispensable to modern information and communication, forecasting and navigation—to mention only a few well-known examples that have a considerable impact on international economic relations.

As our collective dependence upon such space-based assets has grown, so too have legitimate concerns about the security of these assets. This has stimulated an important debate about the nature of space security. Indeed, we have arrived at a point where there are serious concerns about the preservation of outer space for "peaceful purposes" and a real need to exchange views on the extent of the challenges—and possible solutions. The continuing militarization and moves toward the eventual weaponization of space—whether it is because it is seen to be necessary, or even "inevitable", in order to protect valuable and vulnerable assets, or whether it is to control and dominate the "high frontier"—must be addressed through fresh thinking and increased awareness.

Important questions call for a thorough debate. For example, how can we most effectively balance civil, commercial and military space interests against the need to ensure that our activities in space today will not threaten our secure use of space tomorrow? How can we be assured that space will be maintained for peaceful purposes as defined by our collective obligations under the Outer Space Treaty? How can we assure the security of our space assets? I trust that the discussions during the conference will contribute to formulating answers to these essential questions and will help promote awareness of the necessity to address urgently the challenge of preventing an arms race in outer space.

I should like to thank the Governments of the People's Republic of China and the Russian Federation, the Simons Centre for Disarmament and Non-Proliferation Research and the United Nations Institute for Disarmament Research for jointly organizing this important event. It is my hope that these debates may contribute to stimulating consideration in the

Conference on Disarmament of the need to ensure the use of outer space for peaceful purposes. This is important not only to the Conference on Disarmament—but for the security of the world.

Sergei Ordzhonikidze
United Nations Under-Secretary-General
Director-General of the United Nations Office
at Geneva

ACKNOWLEDGEMENTS

The conference organizers would like to thank all the speakers at the conference for their personal and intellectual contribution to this debate: Douglas Aldworth, Phillip Baines, Duan Zhanyuan, Sarah Estabrooks, Nancy Gallagher, Laura Grego, Theresa Hitchens, Wade Huntley, Rebecca Johnson, Vladimir Kamenskiy, Michael Krepon, Jeffrey Lewis, Li Daoyu, Andrey Makarov, Vladimir Vozhzhov, Detlev Wolter, David Wright, Wu Haitao and Zhai Yucheng.

We are grateful to the Governments of the People's Republic of China and of the Russian Federation, and to the Simons Foundation for their financial and political support that made this conference possible.

In particular we would like to thank Ambassador Hu Xiaodi, Fu Zhigang and Sun Lei from the Permanent Mission of China in Geneva, and Ambassador Leonid Skotnikov, Anton Vasiliev, Valery Semin and Alexey Petrenko of the Permanent Mission of the Russian Federation in Geneva. We are also indebted to Jennifer Allen Simons, director of the Simons Foundation, and Wade Huntley, director of the Simons Centre for Disarmament and Non-Proliferation Research, for their encouragement and cooperation.

Special thanks to Xiaoli Pan and Andrés Nuñes-Rincón for compiling the conference report. AvisAnne Julien edited this publication and Nicolas Gérard, Kerstin Vignard and Anita Blétry followed this publication through the production phase.

The opinions expressed in the papers are those of the authors and the authors alone.

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OPENING STATEMENT BY HU XIAODI

On behalf of the Chinese government and the Permanent Mission of China to the United Nations at Geneva, I would like to extend my congratulations on the convocation of the international conference "Safeguarding Space Security: Prevention of an Arms Race in Outer Space" and extend my warmest welcome to the participating government representatives and experts.

Since China joined the Conference on Disarmament at Geneva in 1980, this is its first attempt at hosting an international conference together with the United Nations and other concerned countries at the United Nations Office at Geneva. It is also the first time that China has sponsored an international conference specifically on the issue of outer space. I would like to thank the United Nations Office at Geneva and our co-organizers, the Russian Federation, the United Nations Institute for Disarmament Research and the Simons Centre for Disarmament and Non-Proliferation Research of Canada for their great efforts in convening this conference.

Outer space is the common heritage of mankind and the peaceful uses of outer space is the aspiration of all peoples. In 2005, outer space is within the reach of more and more countries that are working to realize the objectives of the 1967 Outer Space Treaty, that is, the peaceful uses of outer space for the benefit and interests of all nations.

However, while creating unprecedented opportunities for the international community, the rapid development of science and technology has also brought about new challenges to the peaceful uses of outer space. Changes in the perception of security, the coming of age of related weapons technologies and developments in combat theories all lead to the increasing danger of turning outer space into a battlefield and a place without security. Therefore, I believe it is particularly necessary and timely to thoroughly explore and study the important issues around the overarching topic of "Safeguarding Space Security and the Prevention of an Arms Race in Outer Space".

This conference incorporates a diversity of sub-topics, with a view to reviewing a wide spectrum of outer space related issues and exploring effective means to maintain space security and prevent an arms race in outer space. I hope that, through our exchanges, we will arrive at a better understanding of each other and generate useful recommendations.

The twenty-first century is the century of peace, development and cooperation. To make progress on outer space issues, it is imperative that we uphold multilateralism and strengthen international cooperation. In this spirit, I am convinced that this conference will be able to take one step forward in advancing our common goal.

OPENING STATEMENT BY LEONID SKOTNIKOV

I would like to extend our appreciation to the sponsors of the Conference "Safeguarding Space Security: Prevention of an Arms Race in Outer Space"—the Government of the People's Republic of China and the Simons Foundation from Canada—as well as to UNIDIR, its co-organizer.

I am encouraged that this conference has gathered so many highly competent participants representing various nations, specialized international, academic and non-governmental organizations (NGOs). This shows that the subject matter addressed by this conference is topical and stands high in the agenda of the international community. People in all countries are anxious to keep outer space peaceful for the next generations and not to allow fantastic scenarios of stars wars to jump out of the movie screens into real life.

Many valuable ideas and proposals expressed at the previous conferences on outer space —held in Geneva and organized by Canada, UNIDIR, and Canadian and American institutes—as well as conferences and seminars elsewhere, proved useful for the practical work at the UN, the Conference on Disarmament (CD) and in other international bodies. They raised the understanding of governments of the challenges we all face and inspired further research for solutions. I hope that this conference will make its own significant contribution in this regard. Russia remains open for new proposals and ideas to facilitate progress in preventing the weaponization of outer space.

Outer space is rapidly gaining importance in the everyday life of mankind and in ensuring continued progress for mankind. We have all become increasingly dependent on space-based technologies.

Russia has accumulated a vast experience in outer space exploration. We strongly believe that outer space should remain free of weapons and that space assets should be protected. This is a key global security issue, along with ensuring the non-proliferation of weapons of mass destruction and fighting international terrorism.

It is evident that any action by any state that would place weapons in outer space, install them on celestial bodies or interfere in a hostile way with the normal functioning of outer space objects would undermine international security. The deployment of space weapons, should these be developed, would lead to countermeasures by other states. The result would be a major step backwards in disarmament, affecting nuclear, missile and other issue areas.

Existing international outer space law is not sufficient to prevent an arms race in outer space. In order to close the existing loopholes the international community needs to elaborate an instrument prohibiting the placement of weapons in outer space as well as the use or threat of use of force against space objects. The Conference on Disarmament is the most appropriate forum to negotiate such an instrument.

Prevention of an Arms Race in Outer Space (PAROS) is Russia's clear priority among the issues on the CD agenda. The Russian Federation is definitely in favor of initiating negotiations on it. However, reluctantly, Russia agreed not to oppose a discussion mandate for an Ad Hoc Committee on PAROS. Russia hoped that this move would be reciprocated and that the CD would agree finally on its program of work, thus leading the Conference out of the current impasse. Unfortunately, this has not happened yet.

While waiting for CD deliberations on PAROS to start, the Russian Federation, along with its partners, has been conducting preparatory work for a number of years. Together with China and a group of other co-sponsors, Russia tabled a set of ideas for the possible contents of a future legal instrument to prevent the weaponization of outer space. This legal instrument would be negotiated at the CD after the resumption of its substantive work. Russia is satisfied with the progress to date in discussions of these ideas and would like to thank once again all the delegations that are actively participating in these efforts. Since its publication in June 2002, document CD/1679 was complemented by two thematic working papers on specific aspects of the future instrument, as well as by a compilation of comments and suggestions. Both documents were jointly prepared by the delegations of Russia and China. We will continue our work in this direction taking into account various views including those expressed at this conference.

In conclusion, I would like to say that Russia, committed as it is to the goal of the non-weaponization of outer space, has launched several unilateral initiatives in order to help promote transparency and confidence-building measures in outer space. Last year Russia has unconditionally declared it would not be the first state to place weapons of any kind in outer space. Russia believes that similar political statements by other outer space powers—and we call upon them to do so—could lead to the creation of a "safety net" of interweaving security assurances in space which could be conducive to strengthening outer space security.

CHAPTER 1

CONFERENCE REPORT

EXECUTIVE SUMMARY

Space-based technologies play an increasingly critical role in the maintenance and development of national and international infrastructures. Along with the benefits of the widespread application of peaceful outer space technology, comes the urgent need for the international community to understand, communicate and cooperatively regulate activities in outer space. Potential dangers such as the dissemination of dual-use technologies, the shift from the militarization of space to the weaponization of space and the growing problem of space debris are threatening to undermine security in outer space as well as prospects for its peaceful use by humanity as a whole.

More than 130 states have interests at stake either as space-faring nations or indirectly benefiting from the use of commercial satellites. There is an international consensus on the general principle of "the importance and urgency of preventing an arms race in outer space", as shown by the regular adoption by the United Nations General Assembly, with no negative votes, of a number of resolutions since 1990. However, there has been a lack of political and diplomatic action, and existing frameworks such as the 1967 Outer Space Treaty (OST) and the 1979 Moon Agreement are insufficient for dealing with the challenges that we now foresee.

Understanding the political, legal and technical constraints and assessing avenues for progress are essential to building an international regime capable of effectively and comprehensively dealing with issues concerning space security. It is in light of this urgent need for research and communication that the United Nations Institute for Disarmament Research (UNIDIR) has held a series of conferences.

The conference "Safeguarding Space Security: Prevention of an Arms Race in Outer Space" was convened in Geneva on 21–22 March 2005 and jointly hosted by the Governments of the People's Republic of China and the Russian Federation, UNIDIR and the Simons Centre for Disarmament and Non-Proliferation Research. The Government of the People's Republic of China and the Simons Foundation provided financial support for the conference. Representatives from Member States and Observer States of the Conference on Disarmament (CD), experts and scholars from Canada, China, the Russian Federation, Germany, the United States, the United Kingdom and other countries, totalling more than one hundred people, participated in the conference.

SESSION ONE: THE NEW SPACE AGE—WEAPONS, DEVELOPMENTS AND CHALLENGES TO SPACE SECURITY

Session one provided insights into the current trends in the development of space technology and how these affect both international cooperation and space security. International cooperation should be the highest priority of the international community. The twenty-first century will require the world community to undertake systemic research with the assistance of space-based technologies. One avenue for collaboration would be to work toward the creation of an international outer space agency and to cooperatively conduct large-scale resource-intensive outer space research projects within the framework of the United Nations.

The costs and harm associated with an ill-regulated environment for space activities were exemplified in an analysis of the "qualitative changes" in conditions in near space. The increasing volume of objects launched for military purposes—such as small satellites and new super-small assets—is threatening to over-populate near space orbits and lead to reduced visibility. The development and dissemination of small size and cheap strike systems, capable of creating small pockets of orbital debris that would deny other parties access to space, if unmonitored, could lead to a new arms race. It could also make space activities more costly by requiring the enhanced protection of satellites. Concern about the "technical littering" of space and the problem posed by space debris was expressed. In order to meaningfully address these matters, the international community needs to develop a legal regime that builds upon initiatives such as the declaration by the Russian Federation of non-first placement of weapons in space and

the joint Chinese–Russian proposal to the Conference on Disarmament (CD/1679) of a possible future international legal agreement.

The effects of orbital debris on space security and the urgent need for action were a major focus. Debris is threatening to degrade the already fragile space environment and may render space unfit for human endeavours. The amount of existing debris is considered to far exceed that currently identified by the National Aeronautics and Space Administration at 13,000 large pieces, especially at the most heavily used low-Earth orbit. Debris will cyclically collide with each other and thus create more remains that effectively form a lethal shell around the Earth. Despite the widespread acknowledgement of the danger of orbital debris, the problem has not received sufficient attention. Efforts such as the proposal to set working guidelines in dealing with space debris June 2007 at the United Nations by are considered vital. The placement of non-offensive weapons around satellites or non-debris producing weapons should be a cause for concern, since these weapons themselves could be targeted by parties using low-cost, low-technology weapons that create fields of debris and destroy the other more technologically advanced weapons. An international legal regime should aim to ban the placement of any weapon in space.

Laura Grego (Union of Concerned Scientists) presented the findings from a study that examined the technical realities of the four new space projects proposed by the US military. One project foresees using space-based assets to attack ground targets, however this project will find it difficult to gather support as it competes against much less expensive ground-based alternatives. The second project, which comprises space-based ballistic missile defences (BMDs), requires a large-scale constellation of assets in space to be effective. According to Grego, such constellations are inherently vulnerable to attack, since the whole system can be subdued once an attack on a single point succeeds. A third project attempts to use space-based weapons to defend satellites from attacks. However, as Grego points out, this project suffers from the same flaw as the second one. Therefore, making satellites more robust may prove a more reliable option. According to the study, the only advantage of space-based weapons is to attack other satellites. Placement of anti-satellite (ASAT) weapons is predicted as one of the initial moves that would put weapons in space. Grego concluded by noting that the countries that are best equipped to put weapons in space also have the most interest in ensuring the safe use of space.

During the discussions that followed, strong support was expressed for the work of this conference and the principle against the placement of any weapons in outer space and starting work on an international agreement on the Prevention of an Arms Race in Outer Space (PAROS) at the CD, including the establishment of an ad hoc committee to work without limitation on any issue concerned with outer space security. The central role of the CD as the single multilateral forum for discussions about this issue was reaffirmed, and it was suggested that the Chinese–Russian proposed working paper (CD/1679) could serve as the basis for further substantive discussions.

The problem of space debris brought about varying reactions from the participants. On the one hand, there is a need for more expert research into the issue and the publication of these studies, while on the other hand there were doubts voiced about the extent of the seriousness of the issue, accompanied by requests for quantitative evidence of accidents caused by debris.

SESSION TWO: THE RELEVANCE AND URGENCY OF PREVENTING THE WEAPONIZATION OF AND AN ARMS RACE IN OUTER SPACE

The consequences of placing weapons in space in the current international order and on space-based human activities are regarded as damaging. Since space systems are meant to function autonomously, any technical failure may seriously damage the normal functioning of human activities—and should these systems involve space weapons, the situation may spin out of control and lead to irreversible consequences for humankind. Apart from the debris problem, in the course of placing weapons in space, orbital groups of spacecrafts limit the accessibility of others, thus challenging the nature of space as an unlimited natural resource for all mankind. It was proposed that the United Nations discuss the issue of jurisdiction in space, taking into account the interests of developing countries. The effect of placing weapons in space with the international strategic status quo could also be destabilizing. Were any country to deploy weapons in space, this would have strategic implications, as the unilateral advantage could invite retaliatory measures from other countries. This could lead to arms competition in outer space and to the proliferation of other weapons, whether nuclear or weapons of mass destruction (WMD).

This could bring existing arms control and disarmament efforts to naught and, some fear, bring the international order back to the time of the Cold War.

Science and technology could be regarded as a "double-edged sword", particularly given the current loopholes in existing international regimes. Some doubts were expressed about the growing benefits derived by communities worldwide from space technologies from the emerging new military concepts and theories such as "control of space" and "occupation of space" as well as the research and development of space weapons programmes. The General Assembly has adopted a series of treaties with regard to space security, but they have the following four loopholes in common:

1. they concern exclusively the prevention of testing, deploying and using only WMD in outer space;
2. they neglect the issue of the threat or use of force from the Earth toward space;
3. they do not fill the gap left by the end of the Anti-Ballistic Missile (ABM) Treaty; and
4. they lack a provision for universality.

The US policies toward space security have been at the centre of international controversies in many respects. Jeffrey Lewis (University of Maryland) provided an assessment of the extent of seriousness of the perceived American commitment to developing space weapons. Within the two broad categories of the US official policies—the defensive Space Control Project, which includes surveillance, denial of access to space to others and defence satellites, and the Space Force Project, which is more offensive in nature—Lewis found that the latter is still constrained by its limited funding and the lack of commitment from the Defense Department as well as from Congress. Projects such as the space-based BMD system, contrary to their much-deserved international attention, are neither obtaining the necessary funding nor are they being pushed forward by the US Defense Department for fear of potential public opposition. Listing several other controversial projects, such as an offensive counter-communication system and a space test-bed for ASAT weapons, Lewis concluded that they are either being cancelled, delayed or the result of a purely idiosyncratic pursuit by certain individuals within the defence system. Instead, Lewis suggests that programmes that are more deeply

embedded within the budget, such as the large amounts dedicated to building capacity in space surveillance sensors with potential ASAT capabilities, will be the eventual indicators of US policy toward the weaponization of outer space. The degree of urgency on this matter is measured in years not months.

David Wright (Union of Concerned Scientists) examined the driving force behind the US interest in ASATs and space weapons, and expressed his hope in diplomatic efforts since, in his view, the placement of weapons in space does not ensure against the vulnerability of satellites. The most commonly discussed motivation for weaponizing space within the United States, that is, to protect vulnerable US space assets, is unfounded in Wright's view. There is no evidence that US assets are susceptible to a "space Pearl Harbor" scenario of debilitating attack and, referring to Grego's speech, ASATs and other space weapons are neither the effective answer nor the only solution to reducing such vulnerabilities. The real driving force behind the push for space weaponization lies in the intention of ensuring US space superiority through offensive ASAT capabilities and space-based missile defence interceptors. To this end, Wright asserts that deploying ASATs or space weapons first does not translate into a lasting advantage, as the monopoly on these weapons will not hold. Neither should this desire be driving national policy, nor should other countries feel compelled to follow suit. There exists a window of opportunity for diplomatic efforts, especially among space-faring nations to assure each other of their peaceful intentions, particularly through unilateral declarations to not to be the first to place weapons in outer space, such as the declaration made by the Russian Federation.

Following the presentations, the participants exchanged views regarding:

- what the response of states should be to a situation where one country initiates the placement of weapons in space;
- the verification aspect of a treaty on PAROS; and
- the concept of "deterrence" in reference to security in outer space.

On the first point, some suggested that states should take time and deliberate on their response. Given the complexity of space affairs, the specifics of each scenario must be judged with patience, caution and in coordination with one another. One view was that the United States is still

far from being able to put weapons in space and that certain activities are designed for intimidation purposes instead. Other voices asserted the importance of prohibiting the placement of weapons in space as a matter of principle. However, should it occur, immediate international efforts should be undertaken to rollback the placement of weapons in space.

Some participants emphasized that outer space security involves many uncertainties and "murky" situations, such as flight tests that in some circumstances can indicate that space weapons testing is taking place. This also applies to the means developed to verify compliance with a prospective PAROS agreement, since inspector satellites could also have ASAT capabilities. The participants thereby encouraged the international community to think in less black and white terms. And, using the analogy of the Comprehensive Nuclear-Test-Ban Treaty, they expressed the hope that efforts to build an international legal framework to safeguard space security should not be deterred by the inherent technical difficulties of verification. The apparent inability of the CD to move forward and achieve substantial progress on PAROS was also addressed. However, many continued to affirm the central role of the CD and advocate both unilateral declarations and collective diplomatic efforts by all states.

When the concept of nuclear deterrence was discussed with reference to its potential applicability to outer space, it was strongly asserted that there are no grounds to make such a comparison. While nuclear deterrence is meant to prevent nuclear attacks between nuclear weapons states, the only country with the capability to implement such an attack in or from outer space would be the United States. It would seem extremely unlikely that the United States would envisage such an attack and therefore seek first deployment in space since such a course of action would prompt others to deploy weapons in space and thus potentially launch an arms race in outer space.

The discussions also brought about greater insight into the concepts of "militarization" and "weaponization" of outer space. While outer space has been used for surveillance and information gathering for military purposes, one participant emphasized that the term "militarization" should not be taken for granted, as it also denotes a state of confrontation, and should be applied with more discretion in reference to outer space.

SESSION THREE: ELEMENTS OF NATIONAL/MULTILATERAL POLITICAL, LEGAL OR LEGISLATIVE INSTRUMENTS FOR REGULATING WEAPONS IN SPACE

In lieu of the division between the two prevailing schools of thought, one advocating the prohibition of any weapons in outer space and the other advocating prohibition of offensive weapons, an approach that aims for "a comprehensive global cooperative security order" was suggested. A proposed common security in outer space (CSO) treaty has at its core the terms "mankind" and the "peaceful uses" of space, which are stipulated in the 1967 OST and were recognized by the General Assembly (as early as resolution 1148 in 1957) by consensus from the then superpowers, and the concept of "common security" that denotes security achieved through cooperation. As research illustrates, in encompassing these clauses and norms, the effort to ensure space security could complement other arms control and disarmament regimes and move security configurations away from "mutually assured destruction" (security by deterrence) to "mutually assured security".

Given the de facto acceptance of passive military uses of outer space (for example, reconnaissance satellites), the significance of the "peaceful uses" of space clause was underlined. A three-step proposal was made to formalize and achieve legal status for the principle of "peaceful uses" of outer space. First, the General Assembly should vote on a resolution reaffirming the principle; second, the General Assembly should request an authoritative definition of the clause on "peaceful uses" from the International Court of Justice; and third, working groups should be established at the General Assembly to discuss the opening of negotiations on a CSO.

Sarah Estabrooks (Project Ploughshares Canada) presented a survey of the new developments and trends in activities related to space security in 2004. As a widely used term, "space security" is defined in terms of the "secure and sustainable access to and use of space" and "freedom from space-based threats". Overall, the survey found that access to space for civil and commercial purposes is increasing; that military-commercial interdependence is rising as are terrestrial military operations' reliance on space-based assets; that the United States continues to dominate in the application of space-based assets for military purposes and in developing space assets protection and negation capabilities; and that there continues

to be a deadlock in international discussions about PAROS. Estabrooks stated that the issue of space weaponization cannot be dealt with independently from other activities in space as they are interlinked. Thus, the division of work that currently exists within the multilateral forum—that is, the General Assembly, Committee on the Peaceful Uses of Outer Space (COPUOS), CD and International Telecommunication Union (ITU)—needs to be adjusted.

Possible solutions to the deadlock in international discussions about PAROS that have prevailed since the mid-1990s were examined. Given the complexity involved in determining the nature of space weapon systems and behaviours, one solution would be to apply different legal norms to different situations. Prohibitive, restrictive and permissive measures could be implemented whether the system or behaviour in question resembles a space weapon or simply a harmful force against other space objects. There are two ways to institutionalize these measures into a legal instrument: the comprehensive and the partial approach. While comprehensively banning all space weapons, from their research and development to their deployment and use, is desirable this does not constitute a realistic common ground between countries for breaking the current deadlock and moving negotiations forward. The partial ban on behaviour approach—that is to say banning the deployment of weapons and the use of force in space—could be more realistic.

After having suggested that participants take a broad and comprehensive view of space security, Nancy Gallagher (University of Maryland) reflected on a variety of elements that conditioned the apparent shift in the US military doctrine. The US initiative in setting an international code of conduct and norms against the weaponization of space came about in the context of the Cold War thinking on strategic balance and at a time when space science and technologies were still at their infancy. The military doctrine under the Bush Administration calls for "coercive prevention". It has emerged against the background of greater US space capability superiority, wider application of space-based assets and the development of a commercial space industry. Taken together, these elements create more incentives for securing space dominance and defending national self-interests. However, Gallagher suggested that such contradictory thinking to the OST has not yet translated into official policy and is likely to face public objection within the United States. Gallagher concluded by pointing to the need for consolidating the principles and norms of the OST, and raised

several concrete points for further exploration: how to define "non-destructive" space weapons and "legitimate" military activities; how to set a limit on the relationship between "transparency" and "control" over military issues that creates favourable conditions for countries to open discussions; what is meant by "stabilizing" strategic implications in the current environment; and what are the next steps in missile defence now that the ABM Treaty no longer exists.

The participants engaged in substantive discussions about several points raised in the presentations.

- Many participants optimistically viewed the link between the efforts of PAROS and other international arms control and disarmament regimes. One participant considered the 2005 Nuclear Non-Proliferation Treaty (NPT) Review Conference as an opportunity to make the NPT norms more relevant and contribute to reducing the motivation for placing weapons in outer space. The weaponization of outer space, as one participant stated, is a form of vertical proliferation. Moreover, it was added that the US proactive posture against proliferation of WMD on the Earth should constitute the very reason for not placing weapons in outer space in the first place.
- Views were divided on the issue of whether or not to amend the 1967 OST to extend the ban to cover all weapons. While such a proposal was discussed in official fora, some participants insisted that more might be lost than gained in opening up the OST for amendment.
- On the issue of verification, some participants suggested that while the issue is being understandably side-stepped in the light of the realities of international negotiations, it should not go without mentioning that, should there be a weapons ban or immunity regime for civil/peaceful space assets, a multilateral verification regime should be put in place.

In response to questions about establishing an alternative forum for work on PAROS, given the continued deadlock at the CD, it was proposed to establish an alternative forum under the General Assembly in the form of an open-ended working group. Such a structure would also serve to correct loopholes in existing regimes, such as overlooking weapons other than WMD.

SESSION FOUR: SPACE SURVEILLANCE, MONITORING AND COMPLIANCE FOR INTERNATIONAL INSTRUMENTS

Michael Krepon (Stimson Center) remarked that there still is no general consensus on international instruments giving complete guarantee for real space surveillance and monitoring. Krepon argued that the Code of Conduct Against Ballistic Missile Proliferation (2002), the Proliferation Security Initiative (2003) and the European Code of Conduct for Space Debris Mitigation (2004) are precedents that show that the advances made on space surveillance and monitoring have set general principles, reaching modest commitments and limiting confidence-building that do not represent real and effective surveillance and monitoring.

Achieving real surveillance and monitoring is possible if a code of conduct for space were to be established. Taking into account the rules that already exist (the OST, Astronaut Agreement, Liability Convention, Registration Convention, ITU), their gaps and introducing key provisions (no simulated attacks, no dangerous manoeuvres, no harmful use of lasers, mitigation of space debris, space weapon restrictions), it should be possible to devise a code of conduct that prevents the misuse of space assets and grants space security for all through surveillance and monitoring. This requires, besides a great deal of work by experts, a set of reassurance measures (cooperative monitoring, transparency, registration, notification, traffic management, no commercial interference) based on effective verification. Within this framework, governments must set up national programmes for verification and prevention of the weaponization of space.

The importance of a verification regime for an international agreement on PAROS was highlighted and the specific practical elements of verification were examined. Efforts on PAROS, such as the Chinese–Russian joint proposal to the CD, are in essence prohibitive measures. To that end, verification would be the essential element of an international agreement. On-site inspections including a permanent base for inspection at space stations was suggested as an option for verification. This could be an inexpensive option, predictable and technically feasible, unlike ground-to-space surveillance and verification systems or the use of special satellites for inspections. Nevertheless, while the objective of verification is easily judged, it is a difficult task in practice to define the "object of verification"; in this case to define "space weapons" and "threat or use of force toward space objects". Not all provisions of a treaty can be reflected in the

verification context and not all international legal instruments require a verification regime. Verification of compliance with PAROS could be achieved under a separate protocol, but would require further assessment of the political, financial and technical context on which the agreement is based. Notwithstanding the essential role of verification, in order for substantive progress on an international legal agreement on PAROS to be achieved, it could be reasonable to postpone discussions on verification, while measures to enhance confidence and transparency must be encouraged.

The importance of treaties, particularly those related to arms control (including outer space), for global peace was discussed. In 2005, outer space has the same strategic importance for states that nuclear weapons had a few decades ago. Information technology now represents the difference between winning and loosing a war, allowing states to collect specific data to prevent and/or execute attacks. Space weapons, can in fact, support the use of weapons on the Earth. In order to assure security for all countries, it was thought important to prevent world and space weaponization through general agreement on and implementation of treaties for arms control, including effective surveillance and monitoring.

The continued development of BMD technology, the deployment of BMD systems and the policy of pursuing space control must all be considered as part of the outer space weaponization problem. The fundamental legal instrument governing outer space activities, the OST, has loopholes with regard to the prevention of outer space weaponization, and no international consensus has been reached on how to address the serious challenges facing outer space. However, important proposals concerning verification have been made (such as the non-paper *Verification Aspects of PAROS*, presented on 26 August 2004 at the CD by the Chinese and Russian Delegation to the CD). These proposals are valid points of reference in defining the capabilities and characteristics of effective verification measures, such as on-site inspections carried out at launch sites and made by international observer teams.

Effective verification measures are indeed important to enhance the confidence of state parties to a treaty. However, as no weapon has yet been deployed in outer space, the measures under discussion are purely preventive in nature, and consensus must be achieved first on prevention, rather than verification. If prevention of outer space weaponization is

reached on the basis of a common political will, then other issues, such as verification, could be easier to approach.

Following the presentations, the participants exchanged views about what should be taken into account regarding space surveillance and monitoring:

- the need for further work on a treaty that prevents the weaponization of outer space, and that contains methods of verification;
- the utility of a code of conduct that includes elements of no deployment of weapons and no use of harmful lasers (taking into account the fact that not all types of lasers can be banned);
- the need for a clear definition of space weapons as an important part of a treaty and for the development of a serious verification regime that must include all state parties (the issue of the ill-defined scope of the concept of verification was mentioned as part of the problem, since it prevented the development of an effective verification regime);
- the importance of political willingness and of not considering the lack of agreement on verification as an obstacle for a treaty preventing outer space weaponization, keeping in mind that before talking about verification it is important to define precisely what is going to be verified; and
- the use of a group of experts to establish general concepts that will benefit the implementation of a treaty.

SESSION FIVE: THE ROAD AHEAD

Opening remarks made by Theresa Hitchens (Center for Defense Information) underscored that there is still time for an international effort to block the advent of space weapons through prevention and space surveillance. This international effort must focus on engaging states that have "no clear" political willingness to participate in the banning of weapons in outer space (namely the United States), in areas where it is directly in their national interest to cooperate with other space-faring powers in the near-term.

According to this "effort focus", scientific and diplomatic efforts are needed to shape an understanding that outer space weaponization will endanger various national interests, thus discouraging states from pursuing

destructive anti-space capabilities. The work on space debris mitigation can be a good opportunity to start building this understanding, because this known hazard to operations in space, which makes no distinction between enemy and friendly assets, has a clear link to states' national interests. A specialized committee and an inter-agency body—that is, COPUOS and the Inter-Agency Space Debris Coordination Committee—have already started setting voluntary guidelines for all space-faring powers hoping to have clear, generally accepted and implemented international guidelines for space operations. This logic could be used for the whole issue of space security by emphasizing the need for better and more reliable space surveillance data to monitor debris, sharing basic orbital data within an integrated network, improving satellite registration and tracking of space objects. Hitchens concluded that it is important to include all states in the dialogue on outer space security, rather than isolate one state because of its position on space weaponization. Measures that promote cooperation among space-faring powers in areas where they have mutual interests are the key for progress on ensuring outer space security.

Rebecca Johnson (Acronym Institute) alerted the participants to the ambiguous position of the European Union in its cooperation with the United States on space programmes. She addressed the particular issue of the North Atlantic Treaty Organisation (NATO) agreement on developing an Active Layered Theatre Ballistic Missile Defence Programme, a system designed to protect troops on the ground from short-range ballistic missiles. NATO has adopted the vague term of "multilayered protection against incoming threats" in the pursuit of a coherent system that integrates systems from theatre missile defence, mid-range missile defence to communications control and sensors. Johnson warned against the vagueness of this term because it renders missile defences less susceptible to detailed concrete measures and embeds the US interest in space dominance on the NATO agenda. Overall, the European Union supports PAROS, especially with initiatives from certain European governments, such as Germany and the United Kingdom. While the European Space Agency (ESA) advocates the peaceful development of space assets and the peaceful use of space, the underlying contradiction between the European Union space policy and the NATO space defence policy needs to be addressed. Johnson called on the European Union, NATO and ESA to collaborate more with each other and for the European Union to further engage with the wider international community. It was also suggested that the proposal by Egypt and Sri Lanka

to the General Assembly should be made more relevant, and that a group of experts on verification should be proposed.

Discussion on how to preserve security in outer space and prevent an arms race in outer space generated three options:

1. **Refrain from any restrictions on the use of outer space**. This would lead nowhere and jeopardize the peaceful use of outer space since various types of weapons would be put in orbit.
2. **Put limited restrictions on the use of outer space by relying on international pressure and national political willingness**. This option depends on international political efforts to oppose the weaponization of outer space. However, political willingness is not enough to maintain outer space as peaceful and needs to be combined with legally binding instruments to restrict the development and deployment of space weapons.
3. **Develop strict legal measures to prevent the danger before it starts**. This seems to be the most promising road. Over the years, the international community has developed a number of instruments regulating the access to and use of outer space. These include regulating the protection of space vehicles, international liability for damage caused by space objects, confidence-building measures, prohibition of the placement of nuclear weapons or other WMD into orbit around the Earth or on celestial bodies, prohibition of the militarization of the Moon and prohibition of the development, testing and deployment of missile defence systems and their components in outer space. However, these instruments, which are components of this option, are still quite limited. The OST prohibits only the deployment of nuclear weapons and other WMD in outer space, leaving other types of conventional and/or new concept weapons unchecked. To address this problem, we need to revamp the international legal system on outer space; in particular, we need to ensure that a comprehensive regime preventing the weaponization of outer space and an arms race in outer space is developed. A sound intellectual basis on which to build already exists and is reflected by the proposals made by several states to the United Nations and the CD. The CD, in particular, constitutes a competent negotiating body of which states must take full advantage to establish a general agreement on the principles and regulations regarding the peaceful uses of outer space. With these two elements, the intellectual basis and the

existence of a negotiating body, states should begin to develop a relevant international legal regime to prevent the weaponization of outer space.

The participants exchanged comments, expressing the following ideas:

- monitoring should not be seen as an expensive option because monitoring will be supported by capacity-building measures;
- the need to re-enforce political commitment and involve major world players;
- awareness is not a problem because it is already growing and "on the way"; and
- taking a cooperative approach is important, as long as it goes in the direction of securing and monitoring the use of outer space, and guaranteeing the universal access to outer space.

CLOSING SESSION: SUMMARY OF DISCUSSION AND THINKING AHEAD

In his concluding remarks, Hu Xiaodi (Ambassador for Disarmament Affairs of the People's Republic of China) pointed out that the conference has galvanized the consensus on peaceful uses of outer space and deepened all parties' understanding of the importance of safeguarding space security and preventing an arms race in outer space through legal and political means. In his view, this conference has brought about a range of useful recommendations, including improving the 1967 OST, constructive engagement and cooperation, verification, unilateral declaration on no-first-deployment of weapons in outer space, a space code of conduct, negotiating a legal instrument to prevent the weaponization in outer space and ensuring space common security that need to be further explored by the international community. Finally, Ambassador Hu called upon all participants to work together to preserve a peaceful outer space for future generations.

Ambassador Leonid Skotnikov, Permanent Representative of the Russian Federation to the CD, recognized the substantial contribution of the highly competent participants, concerned international organizations and other expert scientists and academics to the conference. Various nations reaffirmed their positions to preserve outer space free of weapons. Space

security was pointed out as a key global security issue, along with the non-proliferation of WMD and fighting terrorism. Any action by any state that would result in placing weapons in outer space would undoubtedly undermine international security, representing a major step back in disarmament efforts. He added that this conference offered a deeper understanding with regard to international legal instruments to safeguard space security, emphasizing that the existing treaties have loopholes and are insufficient for effectively preventing an arms race in outer space today. Ambassador Skotnikov argued that prevention is not unattainable if agreement on an international legal instrument on PAROS can be reached. The CD is the most fitting multilateral forum for discussions about the issue of PAROS, and it is important that initiatives be followed up. He expressed his hope that the flexibility already shown by China and the Russian Federation would be reciprocated.

Patricia Lewis, Director of UNIDIR, provided a summary of the issues addressed and noted that the discussions have brought the issue of space security to a new level of political immediacy and urgency. The momentum of debates around the world was considered an encouraging prospect. Patricia Lewis took note of the following points:

- space is for everybody and havoc in space means havoc for everybody;
- cooperation is the key to dealing with space activities, not only because space is a common heritage for all but also because of the significant costs incurred in space exploration;
- the gap in technological capabilities is increasing, and the volume of investment in technology research and development and involvement in space activities by commercial investors is something we should remain attentive to as we all have an interest at stake; and
- space debris havoc would damage the interests of all and put human exploration of space to an end.

Thinking ahead, it should be a priority for the international community to achieve a programme of work. Outstanding issues demanding further study and discussion remain, including a clear and authoritative definition on “weaponization” and “reversible/permanent damages” and the specifics needed to establish a verification regime, either under the General Assembly or at the CD.

Lewis considered the annual review undertaken by the Space Security Index as an important element of international work on the issue. Moreover, the principle of "cooperative security" is a positive input as are the proposals made to the General Assembly by countries such as Egypt and Sri Lanka. She maintained that since the United States and other nations' interests coincide on the issue of outer space, constructive discussions of common interests could serve to bring about a breakthrough in international fora. The Chinese–Russian joint working paper should receive further consideration at the CD. Lewis concluded that we should look expectantly for the next country to make a significant move to follow the Russian declaration of no-first deployment of weapons in space.

CHAPTER 2

THE RUSSIAN FEDERATION'S PRIORITIES IN THE FIELD OF EXPANDING INTERNATIONAL COOPERATION IN THE USE OF OUTER SPACE

Vladimir Vozhzhov

As of 2005, over 130 countries are actively involved in the conquest of outer space, a new area of human activity. International cooperation in the peaceful exploration and use of outer space is growing. Modern space science has opened up new opportunities to effectively address the global problems facing mankind, including the most important of all: ensuring international security. At the same time, it is not making full use of the most up-to-date equipment and advanced technology, which could be used extensively in space activities by the world community with the aim of addressing today's global problems such as:

- ensuring comprehensive international security;
- protecting the environment; and
- ensuring socio-economic development.

From the first years of the space age, the Russian Federation opted for the extensive use of outer space through international cooperation. Flights by foreign cosmonauts on Russian spacecraft and space stations, the Apollo-Soyuz Test Project, international collaboration in operations on the Mir space station and the International Space Station and many other examples clearly demonstrate the Russian Federation's commitment to effective models of partnership and international cooperation. The development of international cooperation on the basis of equality and mutually beneficial partnership in the field of space activities is one of the Russian Federation's main priorities. The development of the space potential of states and the organization of joint efforts as well as the expansion of international cooperation have acquired special significance in addressing the global

problems facing mankind, including the need to ensure international security.

The United Nations General Assembly has reaffirmed the commitment of its Member States to the development of international cooperation in the exploration and use of outer space for peaceful purposes, and has radically changed its approach in conducting space activities. States have recognized the advantages of joint efforts in space activities, of defining common goals and the need to make the best use of financial resources for space activities. One of the primary examples is the creation of the International Space Station, a huge project based on a promising and effective model of international cooperation.

Effective cooperation in space is impossible without active international collaboration, which has a huge multiplying effect with the combined potential of the countries in the global space community. Only by merging the efforts of all countries will it be possible to address the tasks facing humanity: preserving life on Earth, ensuring security and raising the living standards of all peoples. The significance of international cooperation will only increase in the future.

The range of international cooperation of the Russian Federation is growing as it pursues active integration of international space projects and programmes with India, the European Union, the United States, countries in the Far East and South-East Asia and other partners. Broadening links with all countries in every possible way in order to ensure its sustained development and that of the international community is a key priority of the Russian Federation as it pursues the development of international cooperation in the conquest of space. As many as 24 intergovernmental agreements have been concluded and implemented with the European Space Agency (ESA), the National Aeronautics and Space Administration (NASA) and countries such as Brazil, China, India and Japan.

Roskosmos, the Russian federal space agency, and other ministries and departments as well as enterprises that manufacture space and rocket equipment, are engaged in international space cooperation in the following key areas:

- use of Russian rockets for launching foreign payloads, including the formation of joint enterprises with foreign partners;

- joint development of rocket engines, specifically the RD-180 for Atlas-type launchers;
- investigation of scope for the launch of Russian rockets from near-equatorial launch facilities—for example, the "Soyuz-Kourou" project and talks with Australia on the possibility of building a space centre on Christmas Island in the Indian Ocean;
- partnership in constructing the International Space Station and conducting scientific experiments on-board;
- the field of fundamental space research, for example, in the development of the "Spektr" project with extensive cooperation from foreign partners including ESA, NASA, and the German Space Agency;
- participation in the "Integral" project;
- implementation of projects in the field of space medicine and biology ("Bion" spacecraft) and meteorology ("Meteor-3M" with the US SAGE-3 instrument); and
- development of the "Kospas-Sarsat" international space rescue system ("Nadezhda" spacecraft).

Under the Russian Federation's blueprint for the development of space activities, the principal tasks involved in the development of international cooperation in the field of space research are:

- to combine efforts at the inter-state level and establish close links and widespread cooperation with national space agencies of all countries and international organizations, ranging from concluding long-term agreements and the creation of partnerships for the implementation of joint initiatives and projects to concluding individual agreements for the provision of services and the sale of equipment and assemblies;
- to continue to develop cooperation in the implementation of major resource-intensive projects in the field of fundamental space research, to develop future launch vehicles and provide launch services, manned programmes, interplanetary expeditions and exploration of the universe, and to further navigation, meteorology, monitoring of the Earth and circumterrestrial space and other areas; and
- to combine efforts and broaden international cooperation in the use and investigation of outer space for peaceful purposes under the auspices of the United Nations, at the international, intergovernmental, inter-agency and enterprise levels.

The Russian Federation plan for the development of international cooperation for the use and investigation of outer space for peaceful purposes during the period 2006–2015 contains provisions to use outer space on a greater scale with the aim to address the key problems facing mankind as well as to more actively use the space potential built up in the scientific, technical, technological and resource fields.

At the same time, it is impossible not to see that underlying the pursuit of the peaceful uses of outer space by the international community is the threat currently facing the world community and international security in the shape of the incipient militarization of space. After the United States renounced the 1972 Anti-Ballistic Missile (ABM) Treaty, the international legal regime, which had ensured strategic stability in circumterrestrial space, was distorted. In a growing international legal vacuum, many space powers subsequently actively engaged in developing technology and equipment that could be used for military activities in space. The use of inner space as a new arena for military activities is causing significant changes in the nature of preparations for and the conduct of armed conflict. As a new area for military activities, space is also attractive because a relatively inexpensive (asymmetric) strategy can be used to cause substantial harm at a risk that is markedly lower than the risk attached to the use of conventional armed forces. The deployment of the space component of the US ABM defence system on the basis of small military and supporting space systems, which are inexpensive to produce, will make it possible in the future to create an orbital system that can prevent other countries from launching orbiters into space and also to launch a sudden strike on the key facilities of any state that is the victim of aggression or attack on its armed units on the ground.

The current attempts of the United States to establish military superiority in space will lead to a response from states that may lead to further militarization of space in a new twist in the arms race. The deployment of weapons in space will increase the vulnerability of the space infrastructure, of which more than 50% is accounted for by business, telecommunications, exploration and other components of states' socio-economic and defence sectors.

In the near future, the ultimate outcome of these attempts will be a rise in the volume of experiments and tests by many states aimed at creating space weapons. The creation of a military potential in space not only by the Russian Federation and the United States, but also by such states as China,

France, India and Japan will increase the risk of armed conflict and which will be difficult to avert. The deployment of weapons in orbit around the Earth will place new obstacles in furthering the peaceful uses of outer space, including for the United States.

If weapons are placed in space, it will be necessary to introduce immunity for satellites and security zones, and to equip the satellites of the future with additional systems for protection. This will substantially increase the cost of space activities for the world community and slow down the development of international cooperation in space activities as well as the implementation of international space programmes and projects.

All this points to the need to place the problem of monitoring the non-deployment of weapons in space and the prohibition of an arms race in space before the world community. It should be noted that the existing legal regime as applied to outer space does not by itself guarantee the prevention of placing weapons in space. There is still a need for the international legal system to neutralize efforts to militarize space. In addition, the coordination of efforts by international organizations to prevent the deployment of weapons in space is a high priority.

Consequently, the prevention of an arms race in space together with expanding international cooperation in the use of outer space are matters of high priority for the Russian Federation. Thus, among the current items on the agenda of the Conference on Disarmament (CD), the Russian Federation is most keenly interested in a rapid start to dealing with the issue of the prevention of an arms race in space within an appropriate ad hoc committee of the CD.

An initial measure in addressing this problem could be to draft a treaty such as the one proposed by China and the Russian Federation on the prevention of the deployment of weapons in outer space and the use or threat of force against outer space objects. In recent years, the Russian Federation has put forward a number of initiatives designed to reduce and neutralize the efforts of certain states to militarize outer space. Specifically, in October 2004, in the First Committee of the Fifty-ninth session of the United Nations General Assembly, the Russian Federation stated for the first time unilaterally and without any conditions that it would not be the first to deploy weapons of any type in outer space. It called on all states that possess space potential to follow suit. This declaration confirms that the

Russian Federation has no intention of posing a threat to anyone in or from outer space.

At the same time, it must be noted that the possible militarization of space would be the cause of other dangerous factors such as "space debris" and the "growing traffic in small and very small spacecraft". If we assess the influence and significance of these factors in terms of the level of security in space, we must recognize the need to take them into account in addressing the problem of preventing an arms race in space. Thus, these threat factors should be considered in greater detail.

First, there is a clear tendency for the amount of "space debris" to grow. The Russian Federation shares the growing concern of the world community of the danger posed by space debris, first and foremost for the International Space Station and manned space flights.

In pursuing a coordinated sectoral policy aimed at reducing space debris, Roskosmos entered into force the Space Debris Population Standard (OST-134-1023-2000) *Space Technology Items: General Requirements for Limiting the Technogenic Pollution of Circumterrestrial Space* in 2000. The requirements set out in the standard generally correspond to the requirements laid down by organizations and states that are members of the Inter-Agency Space Debris Coordination Committee and require mandatory adherence to guidelines in the design and operation of space and rocket equipment as follows:

- minimization of the potential for in-orbit break-ups;
- removal from orbit after completion of a flight programme in geostationary orbit;
- removal from orbit after completion of a flight programme in low-Earth orbit (< 2,000 kilometres);
- limitation of debris released during normal operations; and
- prevention of in-orbit collisions.

The Russian Federation's space and rocket industry is taking a variety of steps to reduce technogenic pollution of circumterrestrial space. Together with increases in the active lifespan of spacecraft and a ban on the destruction or deactivation of obsolete space objects, these measures include:

- for geostationary orbits, removal of obsolete space objects into "graveyard" orbits; and
- for high-Earth orbits, in which Russian and American multi-satellite navigation systems are operating and European and Chinese navigation systems will soon be deployed, studies that are currently being carried out on the mutual influence of these systems as they develop.

The second threat factor is the growing importance of the extensive use of miniaturization in space technology and the development of small satellites and very small spacecraft, including those with a military purpose. The use of small and very small spacecraft in performing defence functions is currently a strongly developing sector in space technology.

This is demonstrated by the number of symposia and conferences held on this issue in recent years in the Russian Federation and the United States, and specifically a symposium held at the Massachusetts Institute of Technology in 1999, with participation by representatives of the US Air Force, the Lockheed Martin corporation and the Aerospace Corporation, which examined the problem of creating cluster systems in the period 2003–2007 using micro-satellites and nanosatellites with distributed functions (the Tech-Sat-21 programme), as well as using nanotechnologies in space systems and the design of autonomous systems to service spacecraft in space. By 2007, it is planned to create clusters of dozens of micro-satellites weighing approximately 20 kilograms that will each operate as a single system.

An analysis of the development of space objects with small mass and dimensions found:

- a steady increase in the number of countries and avenues of development that are creating space objects using micro-technologies and nanotechnologies;
- increased worldwide interest in the exploration and use of outer space with the help of micro-satellites and nanosatellites, promising relatively rapid application of the "faster-better-cheaper" principle thanks to shorter periods of development for these spacecraft and lower costs for their manufacture and launch into working orbits;
- the existence of practical experience with the corresponding technological programmes (primarily in the United States), which offers

the prospect that space systems consisting of hundreds of micro-satellites and nanosatellites can be created in the near future; and
- the appearance of new light rockets on the world market and efforts to equip existing medium and heavy rockets for launches of micro-satellites in the form of additional payload.

Problems expected in ensuring environmental and military security in circumterrestrial space when small spacecraft are used include:

- a rise in the density of occupation of circumterrestrial space;
- a reduction in the detectability of spacecraft; and
- an increase in the danger that micro-satellites will be used for purposes that run counter to international space law, national space law and criminal law or violate the requirements of such laws.

The consequences of these problems are:

- a rise in the number of obsolete fragments in circumterrestrial space and the risk of collision with operational spacecraft;
- a danger of uncontrollable and hostile actions in space;
- exacerbation of the problem of the electromagnetic compatibility of different space systems; and
- the need to monitor spacecraft throughout their period of active operation and full lifespan.

In considering these factors, it could be concluded that when addressing the scientific, technical and international legal aspects of preventing an arms race in space, it is desirable to take into account, as limiting factors, measures being taken to prevent technogenic pollution of circumterrestrial space, and also measures which must be taken to limit the growing traffic in small and very small spacecraft. (Currently it is forecast that clusters of small and very small satellites will be used extensively for military purposes.)

The objective reality of our time lies in the fact that strategic stability and international security will increasingly depend on what happens and will happen in space orbits and trajectories. Consequently, it is necessary to take firm control of the incipient processes of the militarization of space.

International space activity is an important tool for preventing militarization of space. Active cooperation in international space activities by states in the world community under the auspices of international organizations of the United Nations in the interests of comprehensive international security, protection of the environment and accelerated socio-economic development of states is the most effective strategy for preventing the militarization of space. This aspect of world space activity should become a priority for the world community, all the more so as there are serious prerequisites for this—the requirement for the steady development of the world community.

In the near future, the greatest progress will be achieved on the path of multilateral cooperation among states in the use of applied space facilities. The results of system-based forecasting indicate the following promising and high-priority avenues for the development of space science in the twenty-first century for the world community:

- ensuring the global exchange of information, achievable for all inhabitants of the Earth;
- rational use of transport;
- addressing environmental problems;
- rational use of the Earth's natural resources;
- reliable forecasting of disasters;
- addressing global problems of human survival away from Earth;
- lowering the cost of carrying payloads into space;
- preventing pollution of outer space;
- developing manned flights; and
- integrating countries and developing international space systems.

An analysis of the potential of each of these areas regarding the creation of highly effective space systems showed that on the basis of developed technologies, it will become possible to construct an integrated system of comprehensive international security for the world community, whose role will include neutralizing the actions of the forces of international terrorism.

In the current circumstances, international organizations—the United Nations and its specialized agencies—play an exceptionally important role in the development and intensified use of space facilities for pursuing socio-

economic objectives, protecting the environment and ensuring international security.

There are plans in place, by 2015, to implement urgent international space projects and programmes in such areas as environmental monitoring, fundamental environmental research, efforts to combat natural disasters, management of natural resources and development of the potential of computerization at the state level. In particular, evaluations carried out by specialists have shown that in the near future, the greatest potential from the viewpoint of the useful return on space activities would involve Russian participation such as:

- creation, operation and use of the International Space Station;
- creation of a single global international system of time and geographical coordinates through integration of global positioning systems, Glonass and Galileo;
- expansion of international cooperation in refining and developing the Global Monitoring for Environmental and Security system on the basis of the latest remote Earth sensing technologies;
- extension of fundamental scientific research on the basis of the potential of modern space technologies (for example, the international programmes Integral, Spektr and Mars-Surveyor);
- expansion of international cooperation in refining and developing launch facilities (for example, the Soyuz-Kourou programme, collaboration with the French space agency Centre National d'Études Spatiales and the Automated Transfer Vehicle with ESA); and
- development of international cooperation in implementing the Moon programme and the programme of manned flight to Mars.

US President George W. Bush declared on 14 January 2004 the intention of the United States to begin a space programme for the resumption of manned flights to the Moon, the construction of settlements on the Moon and preparations for an expedition to Mars. It is expected that the United States will create permanent operating scientific stations on the surface of the Moon as a first step toward the conquest of Mars. The US president's statement on a possible change in American space policy during the first half of the twenty-first century was welcomed by states engaged in space activities—for example, France and Japan—which expressed their intention in participating in the implementation of the space programmes and the related projects. The Russian Federation has relevant scientific,

technical and production technology experience, including significant related achievements over recent years in this area, which could be effectively used in the context of international cooperation in the event that the United States pursues the announced programme of interplanetary flights to the Moon and Mars.

At the same time, modern space science has accumulated considerable scientific and technological potential for addressing many global problems facing mankind, including broad and useful space activities of the world community aimed at monitoring (protection) of the Earth as a single ecosystem and the rational use of its natural resources, ensuring the implementation of the strategy for the steady development of the world community, speeding up socio-economic development and creating a system of comprehensive international security and efforts to combat terrorism.

While supporting the US president's initiative, it is essential to highlight the desirability of shaping a broader long-term space strategy for the world community that also contains provisions for addressing both the global problems facing mankind and the proposed US space policy for conquering the Moon and Mars. Such action will correspond to the genuine interests of the world community, since it will create conditions for ensuring strategic stability and the implementation of the strategy for the sustained development of the world community declared by the United Nations.

In conclusion, and bearing in mind the new circumstances surrounding modern international space activities, we wish to highlight the emergence of new threats, that is, the appearance of "gaps" in international law governing the peaceful uses of outer space. We advocate taking practical steps to consign the incipient processes of militarization of space under international control. The investigation and use of space must be pursued for exclusively peaceful purposes. The Russian Federation advocates the adoption of collective measures to address the issue of preventing the deployment of weapons in space and the spread of the arms race into space, and is ready to play an active part in the development of international cooperation in this endeavour.

CHAPTER 3

WHAT SHOULD SPACE BE USED FOR? TECHNICAL GUIDELINES

Laura Grego

Currently, satellites serve a multitude of civilian and military functions, from facilitating communications and weather forecasting to providing highly accurate navigational information, and many nations envision making future investments in satellites for such uses. Generally, the missions that are really well suited to space already exist there.

In the US military, there is also a growing interest in broadening the military uses of space to include basing weapons in space, as well as in developing means to attack the satellites of other nations and to protect US satellites from attack. While space has long been home to military systems such as observation, communication and navigation satellites, these new missions would be a departure from long-held norms.

Deploying anti-satellite (ASAT) weapon systems and weapons in space will have serious consequences, many of which will be discussed at the "Safeguarding Space Security: Prevention of an Arms Race in Outer Space" conference. My colleagues and I at the Union of Concerned Scientists have recently completed a report for the American Academy of Arts and Sciences that examines many of the technical and military issues related to the discussion of space security.[1]

In this report, we focus on a number of key questions: What capabilities could ASAT weapons and weapons in space realistically provide? Would these capabilities be unique? How do they compare with alternatives? What would they cost? What options would be available to nations seeking to counter these capabilities? The answers are technical realities that must be considered in any policy analysis of space weapons and ASAT weapons. Unless debate about these issues is grounded in an

accurate understanding of the technical facts underlying space operations, the discussion and policy prescriptions will be irrelevant or, worse, counter-productive.

In assessing proposed military systems, it is important to distinguish between constraints imposed by financial cost, technology and physics. The cost of operating in space is often high relative to the cost of operating in the air or on the ground. While cost will be important in considering development and deployment, it may not be decisive if the system could provide a unique capability that is deemed important. Available technology places important limits on what systems are currently feasible for a country, but those limits can change over time and do not represent fundamental limitations. Physics, on the other hand, places fundamental limits on space operations that will not change with time and these implications must be taken into account when assessing uses of space.

Several of the key technical conclusions from the report include the following four new proposed military missions for space:

1. attacking targets on the ground or in the air using space-based weapons—the enticing possibility of being able to attack any part of the world quickly and on-demand;
2. intercepting ballistic missiles using space-based interceptors—it is not feasible to stage missile defences from the ground for all potential targets and the Missile Defense Agency is looking to space for this capability;
3. defending US satellites and ensuring US freedom to operate in space: the US military already relies heavily on space for communications, reconnaissance and navigations, and the United States wants to keep these available—for example, precision guided munitions, which have grown hugely in use over the last 10 years, use all three of these types of space assets; and
4. denying adversaries the ability to use space assets—other states have recognized the utility and may want them for themselves.

The first mission, which has attracted considerable public attention and concern, currently appears to be of less interest to the US military than the other missions.

The second mission is an ongoing interest of many missile defence proponents and is leading toward the deployment of prototype weapons in space as part of a space "test-bed". The last two missions reflect the military importance of current US space-based systems. This utility has led to a desire to protect these systems and to deny similar capabilities to potential adversaries.

Before beginning the discussions of the utility of space weapons and how space should be used, it will be very useful to remember two physics facts about satellites (and by satellite, I mean anything that is in orbit). Keeping these two facts in mind will help me illustrate why it is useful to do some things from space and not others.

1. Satellites, by virtue of their great altitude, can see a lot of the Earth at once. This is the biggest driver to putting missions in space—to be able to get a global view. From an airplane, you can see tens of kilometres in your field of view. From the altitude of most weather and intelligence satellites (several hundred kilometres above the Earth), you can see an area on the ground of thousands of kilometres in radius.
2. Satellites must move very fast to stay in orbit. For a comparison, we will go back to the airplane. A jetliner moves about one-quarter of a kilometre per second. A satellite at the altitude of most weather or intelligence satellites moves at 7.6 kilometres per second, 30 times faster than a jet! Because satellites move so fast, it takes enormous effort to change their direction. Thus, satellites are not very good at manoeuvring. And satellites, except under very special conditions, will move with respect to the ground and cannot remain stationary over a given area on Earth.

Thus, space is much better suited to some types of operations than to others. Electromagnetic signals (light and radio waves) can be transmitted over large distances almost instantaneously and with very little energy cost. Space therefore favours activities that entail sending and receiving electromagnetic signals over activities that involve transporting large amounts of mass from the Earth into space or that involve significant manoeuvring in space, which can require a large mass of propellant.

I will briefly discuss the technical issues relevant to these four missions; more detail is available in our paper. But I will spoil the surprise: from our view and from a technical standpoint, only one of these missions has a

useful reason to be carried out in space at all. And this capability is unlikely to be unique or decisive.

MILITARY GOAL: ATTACKING TARGETS ON THE GROUND CAN BE DONE AS WELL OR BETTER FROM THE GROUND THAN FROM SPACE, AND AT MUCH LOWER COST

At first it seems like a good idea, since as I mentioned, you can see a lot of the ground from space.

However, the second physics fact is the kicker. Satellites that are close to the Earth move quickly with respect to the ground. For example, to a person on the ground, a satellite in a low-altitude orbit will appear to go from horizon to horizon in about 10 minutes. Thus, soon after a satellite comes over a target, it is gone again, and may not return for hours or days. If the response time necessary to execute a military mission is hours or days, a satellite could be used, but then there are a number of other military options besides satellites.

For the more strict military mission that is envisioned for space-based weapons the time scale is shorter, that is, a response time under one hour to meet its goal and to be competitive with ground-based alternatives. For this timescale, one would need a *number* of satellites, so that as one left a position, another would arrive in position to attack. The exact number of satellites will depend on the altitude of the orbit and the reach of each weapon, but tens of satellites would be required for prompt attack of one target. For example, a constellation, which could attack any point on the Earth within about 30 minutes, would require nearly 100 satellites. If the promptness requirement were relaxed to a 45-minute response time, roughly 50 satellites would still be required.

In addition to needing multiple satellites, there is another important consideration for basing weapons in space: launch. To get a satellite to the high speeds of orbit, it requires an enormous amount of energy—witness space launch rockets. For a space-based ground attack weapon, the satellites must be orbited first, and then de-orbited to return to the ground. This action is enormously costly. For the five nuclear weapon states, the relative cost of a space-based system would be even higher, because they

already possess intercontinental range ballistic missiles that could provide a prompt ability to attack ground targets globally.

Efforts to reduce launch costs are continuing, but will not significantly change this situation for the foreseeable future.

MILITARY MISSION ENVISIONED FOR SPACE WEAPONS: MISSILE DEFENCE

The global coverage that space-based weapons can provide is also a key motivation for deploying ballistic missile defence interceptors in space.

In principle, a space-based boost-phase missile defence system could offer capabilities that would not be available with a ground- or air-based system—the ability to intercept an intercontinental ballistic missile during "boost phase", that is, while it is being launched, wherever it is launched on Earth. However, because of the short response time this mission requires, the system would be intrinsically vulnerable to debilitating attack and to being overwhelmed.

The timescale required for boost-phase missile defence is 10 times shorter than that needed for a competitive ground attack weapon—just minutes. And so the number of satellites needed for the mission is 10 times larger and will require many hundreds to thousands of satellites.

Besides the issue with cost, which may not be a conclusive argument since there are no feasible ground-based alternatives for this mission, space-based missile defence has another very serious shortcoming. There are inherent vulnerabilities to a space-based missile defence. To frustrate the defence, the targeted country just needs to be able to "punch a hole" in the system, since only a very few of the hundreds of missile defence interceptors will be near enough to a given ballistic missile launch to intercept the ballistic missile.

A space-based missile defence consists of observable satellites with predictable coverage. An attacker can use a smaller and less valuable missile to attack the missile defence satellite and destroy it, and then send its intercontinental ballistic missile through the "hole". The defence will always be imperfect. If your reaction to this scenario is just to "Make sure there are

two interceptors in place!", I draw your attention to the fact that because of the motion of satellites, making sure there are two interceptors in place requires doubling the size of the entire constellation and also points to the ability of an attacker to locally overwhelm the space-based missile defence system.

MILITARY MISSION: SPACE-BASED WEAPONS TO DEFEND SATELLITES

Attacking a space launcher while launching is a virtually identical operation to attacking a ballistic missile while launching. And so the same analysis holds. One cannot reliably deny another country access to space using space weapons.

Using space-based weapons to defend satellites is also subject to the imperfect defence scenario. A "bodyguard" satellite, perhaps based on a micro-satellite, may be able to defend against some of the threats that a satellite would confront, but cannot reliably defend against a concerted or repeated effort by an adversary, especially as the attacks can come quickly.

The best defence is to have a robust satellite system, which has satellites hardened to as many known threats as possible, planned redundancy and spares at the ready; and to have other assets that can provide the lost capability such as uninhabited aerial vehicle-based imagery or laying sufficient fibre optics for communication. This type of planning will need to be done whether or not bodyguard satellites are deployed. In fact, the country with the most dependence on satellites, the United States, is also the best prepared to use other capabilities in the face of their loss.

Making the systems robust has the added advantage of making the satellites less attractive targets because their loss will not pack as big a punch. The commercial satellite industry offers an important example of dealing with component vulnerabilities. The operators of satellite systems must deal with a relatively high rate of failure of space components and minimize the disruption of service to customers.

USING SPACE-BASED WEAPONS TO ATTACK OTHER SATELLITES

In our report, we examine many of the possible modes of attacking satellites, keeping in mind that ASAT weapons will vary in expense, technical expertise required, predictability of success, verifiability of success, whether the effects are temporary or permanent and whether they will be most useful based on the ground or in space. In the table below we show a summary chart of the results. A few of the ASAT techniques are suited to space (the most destructive and permanent techniques), thus space-faring nations will have the most options with regard to ASAT attacks. However, effective ASAT attacks can be mounted from the ground by countries without significant technical expertise; these attacks include many of the temporary ASAT techniques.

	Ground-based	**Space-based**
Uplink jamming	X	
Downlink jamming	X	
Dazzling	X	
Partial blinding	X	X
High-power microwaves		X
Laser damage	X	
Kinetic energy	X	X
Nuclear	X	

Note: "X" indicates that the method of interference is well suited to basing on the ground or in space.

While many ground-based ASAT weapons would be useful for attacking satellites in low-Earth orbits—orbits a few hundred kilometres above the Earth—there are far fewer options for attacking the valuable satellites in geostationary orbits from the ground. Geostationary orbit is 36,000 kilometres above the Earth and is where the orbital period equals one Earth day and the satellite appears to hover over a spot on Earth. It is where a large number of high value commercial and military satellites are stationed.

I want to quickly highlight one of the results from our analysis—it has been suggested by some that a non-space-faring country that possessed a short range ballistic missile such as a Scud could throw up gravel in the path of a targeted satellite and destroy it, and so a non-space-faring nation could hold a space-faring nation's space assets at serious risk. Such an attack would have low probability of success unless the attacker had very good space tracking capability and had very good control over its missile; the understanding of how much control one has over a missile comes from launch tests. Additionally, the owner of the targeted satellite may detect the launch of the attacking missile and move its satellite out of the way; there should be time to do this, and the fuel costs would be modest.

SUMMARY

Based on our analysis of the technical issues, it is possible to circumscribe the space security debate to include the most pressing issues. Of these four potential uses of space that the US military has identified, attacking other satellites is the mission that has some advantages to space basing, and this suggests that there is room for useful discussion and negotiation. The countries that are best able to attack satellites are also those with interest in using space safely themselves. Not to put too fine a point on it, but the United States has more to lose than to gain by opening up space to ASATs and space weapons.

Now, I have been intentionally a bit provocative here. Choices are not always made according to good fiscal sense or technical reality—witness the missile defence programme, which is enormously costly and is without demonstrated capability. However, there are a number of reasons why space weapons could take a different course from missile defence.

Also, I hope that these comments serve to focus our efforts. The initial move to put weapons in space will likely be ASAT weapons or test assets for other programmes such as missile defence—that is, test assets that will have a latent but provocative ASAT capability.

Note

[1] The report is available at <www.ucsusa.org/global_security/space_weapons/>

CHAPTER 4

MILITARY AND POLITICAL ASSESSMENT OF THE CONSEQUENCES OF WEAPONS DEPLOYMENT IN OUTER SPACE

Vladimir Kamenskiy

I would like to share a few views on the possible military policy implications of the deployment of weapons in outer space.

From the very beginning of man's conquest of outer space, military interests have constituted a decisive factor in such efforts. In order to pursue these interests, both individual spacecraft and entire orbital systems have been developed and extensively operated. Space systems are being used on an increasing scale for military purposes. The concept of military activities in outer space has now taken shape in international practice, in other words, any activity connected to the direct conduct of operations for the specific investigation and use of outer space for military purposes.

The Russian Federation's position is that it is necessary to differentiate between two approaches to the military use of outer space. Space systems that have been created to perform information support tasks, without the intention of causing damage to other objects, are not regarded as threatening to international security. Indeed, military systems in space that, for example, play a role in warning of missile attacks, observation and intelligence, communications and navigation have an overall restraint and stabilization function, as we have repeatedly emphasized.

Space systems that were intended from the outset to strike various targets directly or disrupt their normal operation are another matter. Such systems must be classified as "space weapons", by which we mean "systems or devices based on any physical principles that are launched into Earth orbit or placed in outer space by any other means and which are designed or converted to destroy, damage or disrupt the normal functioning of

objects in outer space, as well as targets on the Earth's surface or in its atmosphere". Space weapons are designed to have a direct impact on an adversary's assets, and by their nature they can be either weapons of mass destruction or conventional weapons, including those based on new physical principles.

The Russian Federation has no plans to deploy weapons in outer space. Moreover, preventing the deployment of weapons in outer space is one of the priorities of the Russian Federation's activities in the area of arms control, as we have stated on more than one occasion in various fora, including the Conference on Disarmament.

The deployment of weapons in outer space, possibly transforming it into another battlefield, can in our view lead to serious adverse consequences in the field of military policy. What are our fears based on?

First, at the technical level, space weapons will be based on exceedingly complex systems. In such systems the likelihood of technical malfunction is high and the consequences for mankind can be very serious; they will be particularly unpredictable where weapons of mass destruction are involved. All of mankind will be condemned to live within a kind of psychological "shell" when weapon systems deployed in outer space can be manipulated outside the control of those who placed them in space.

Moreover, a further risk of the deployment of weapons in outer space is the potential short period of time that would be available to make crucial decisions on their military use. Consequently, objectively solving the problems involved in the use of space-based weapons would require the creation of weapon systems where actions on use can be taken without human intervention. For most of their existence, such systems must also operate independently. In such cases there is a substantially greater risk that a situation will lose control following a malfunction or incorrect operation.

Second, a state possessing space weapons would have virtually unhindered capacity to knock out the space systems of an adversarial state, thereby inflicting irreparable damage. The development of a spacecraft and its launch into space demands considerable resources in terms of materials and time, and damage would not be confined to the military component of a space complex. Since the use of space assets involves both military and civilian participants in a highly integrated manner, as well as a large number

of states and international organizations in the case of specific space programmes such as space meteorology and navigation, damage to or disruption of such systems could have irreversible global implications. Such a development would provoke a natural reaction by any state to further protect its spacecraft, and it would be impossible to rule out the intention to carry out warning strikes against spacecraft by developing offensive space systems.

Third, when weapons that are capable of being used against ground and air targets are deployed in outer space, the normal operation of the infrastructure that has a direct bearing on a state's national security will be under direct threat of strikes from space, and this will also provoke the adoption of countermeasures. Countermeasures can be either symmetrical or asymmetrical.

Fourth, it must not be forgotten that space weapons, if developed, would require a series of tests involving the actual launch into Earth orbit of a satellite equipped with a weapon as well as targets against which the tests would be carried out. Naturally, a large quantity of fragments of both the armed spacecraft itself and the targets will remain in space following such tests. This will lead to increased technogenic pollution of outer space and will further exacerbate the already acute problem of "space debris".

Fifth, we must realize that the deployment of weapons in space would undoubtedly lead to the creation of a rather large number of orbital space systems. If these are low-orbit systems (400–1,500 kilometres), they can be composed of several dozen or even several hundred space objects. Thus, a significant number of space objects will be located in low orbit, in turn obstructing the use of this zone by others engaged in space activities. And up until now, this part of outer space has been widely used for Earth remote sensing functions.

Nor can there be a place for space weapons in geostationary orbit. The issue of saturation of geostationary orbit is under constant examination at the United Nations Committee on the Peaceful Uses of Outer Space. This orbit is a limited natural resource and accordingly should be used rationally and fairly for the benefit of all of mankind, with particular attention to the needs of developing countries.

Overall, the deployment of weapons in space would have a serious effect on the military–strategic balance, creating the illusion that a first strike could be made with impunity and multiplying the importance of the surprise factor many times over. Such weapons would therefore be destabilizing regardless of whether they were classified as offensive or defensive weapons.

There is no doubt that if space weapons were created, they would constitute a new type of strategic weapon. This is related to the fact that because of their specific characteristics, any state possessing such weapons would secure considerable strategic advantages. Essentially, it would monopolize access to outer space and the ability to make use of it.

We know from mankind's historical experience that if one state obtains unilateral strategic advantages in any area of military activity, this inevitably leads other states to adopt countermeasures in order to ensure their national security.

In this way, the deployment of weapons of any type in outer space can lead to the most serious adverse consequences—aggravating the international situation by creating a climate of distrust and suspicion, and also undermining the entire existing structure of arms limitation agreements, especially as regards to strategic arms. The efforts the international community has made and is making in the field of disarmament would come to nothing. Ultimately, a new spiral in the arms race is possible not only in space but also on the Earth, including nuclear missiles, which would stimulate the process of proliferation of weapons of mass destruction and their means of delivery.

This would in practice signify a return to the Cold War era. The question arises: Is this what the world community wants? Certainly not.

CHAPTER 5

PREVENTION OF THE WEAPONIZATION OF AND AN ARMS RACE IN OUTER SPACE: AN URGENT TASK WITH NO TIME TO DELAY

Li Daoyu

The prevention of the weaponization of and an arms race in outer space has attracted the attention of the world for decades. With the growing ability of mankind to explore and use outer space, the danger of the weaponization of outer space has become increasingly imminent.

As human civilization enters the twenty-first century, the development of science and technology has offered us an unprecedented opportunity to explore and use outer space. We have witnessed glorious achievements in the peaceful exploration and uses of outer space in recent years, such as the successful landings of the National Aeronautics and Space Administration Mars Exploration Rover "Spirit" and "Opportunity" on Mars, the European "Huygens" probe on Titan, as well as China's historical success in its manned-spaceship programme. These triumphs have aroused mankind's aspirations of exploring outer space; and many countries are responding by establishing their own long-term space exploration plans.

The peaceful uses of outer space have brought tremendous benefits to human development and social progress. More and more countries have gained the capability to explore and use outer space by purchasing or renting commercial satellites. According to recent statistics, countries worldwide have launched over 5,000 spacecraft, including about 600 satellites that are operating in different orbits in outer space. It is estimated that by 2010, there will be 2,000 satellites orbiting the Earth. By then, every aspect of human life will benefit from the exploration and use of outer space. The well-being of mankind will be more than ever closely linked with the peace and tranquillity of outer space.

Science and technology, however, is a double-edged sword. While it brings us benefits, it can also cause disaster. As we cheer for every success of peaceful exploration and use of outer space, we also hear the approaching bugling of war. Space military technology is advancing rapidly. New military and combat concepts and theories such as "control of space" and "occupation of space" are emerging. Research and development programmes of space weapons are being implemented. The danger of the weaponization of and an arms race in outer space is ever more imminent.

Once an arms race occurs in outer space, it would inflict awesome catastrophe on mankind. Being aware of this danger for some time, the international community is striving to conclude international legal instruments to regulate human activities in outer space. The United Nations General Assembly included the Prevention of an Arms Race in Outer Space (PAROS) on its agenda in the late 1950s and since then, thanks to the concerted efforts by all countries, several international treaties related to outer space have been concluded, including the Outer Space Treaty, the Moon Agreement, the Registration Convention, the Convention on International Liability for Damage Caused By Space Objects, and the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space. These treaties have contributed, to some extent, to the prevention of the weaponization of and an arms race in outer space.

However, with the rapid development of science and technology, and with the change of security concepts, these treaties are far from adequate to prevent the weaponization of and an arms race in outer space. There are four, if not more, loopholes within these treaties.

First, they cannot prevent testing, deployment and use of weapons other than those of mass destruction in outer space, especially in orbit around the Earth, other celestial bodies other than the Moon and outer space.

Second, they do not deal with such issues as the threat or use of force from the Earth (including from land, sea or air) against outer space objects.

Third, with the abolishment of the Anti-Ballistic Missile Treaty, the international legal system has been weakened and undermined. And fourth, some of the existing legal instruments lack universality. For example,

as of 1 January 2005, 11 states have ratified and an additional 5 have signed the Moon Agreement.

If we fail to take effective measures in coping with the danger of the weaponization of outer space to prevent the development and use of new destructive military technology and equipment before they emerge, history is likely to be repeated and new tragedies will occur, and our children will suffer heavily for our inaction. Therefore, what we need is action, not debate. The international community should immediately take effective measures to nip the danger in the bud.

The international community has gained broad common understanding in preventing the weaponization of and an arms race in outer space. It is the view of the majority of countries that outer space is the common heritage of humankind. Every year since 1981, the General Assembly has adopted, supported by an overwhelming majority, the resolution of PAROS. This reflects the political will of the international community.

The relevant General Assembly resolution of 1981 states that:

> … the Conference on Disarmament (CD), as the single multilateral disarmament negotiating forum, has the primary role in the negotiation of a multilateral agreement or agreements, as appropriate, on the prevention of an arms race in outer space in all its aspects.

Accordingly, the CD has included "the prevention of an arms race in outer space" on its agenda as a standing topic since 1982. For 10 consecutive years between 1984 and 1995, an ad hoc committee was created to discuss the non-weaponization of outer space. Regrettably, due to a lack of consensus on the programme of work, the CD has not yet started to negotiate an international legal instrument. Given the growing possibility of the weaponization of and an arms race in outer space, all parties concerned should intensify their efforts to move forward.

We are glad to see that, over the years, many countries, including China and the Russian Federation, have been devoted to the early negotiation and conclusion of an international legal instrument on the prevention of the weaponization of and an arms race in outer space. Other countries, intellectual communities and non-governmental organizations

have also put forward many proposals that are conducive to maintaining peace and security in outer space.

Our common desire is for peace and development. The emergence of nuclear weapons in the twentieth century has caused us to live in the shadow of nuclear warfare for decades. It is therefore my sincere hope that no effort should be spared to maintain a peaceful and safe outer space, so that our children will not live in another shadow of fear.

CHAPTER 6

LEGAL APPROACH TO COMMON SECURITY IN OUTER SPACE: AN EXAMINATION OF SOLUTIONS TO OUTER SPACE WEAPONIZATION ISSUE

Zhai Yucheng

INTRODUCTION

The use of outer space is developing in two directions. On the one hand, space technology is used in every corner of contemporary human life; on the other hand, the world has experienced accelerating steps of outer space militarization. The traditional military use of outer space has spread from supportive roles such as communication, navigation, reconnaissance, surveillance and early warning at peacetime, to direct war fighting roles such as command and control, warhead identification, target positioning and bomb guiding. Even worse, outer space is facing an urgent danger of being weaponized and becoming a battlefield. Humankind is standing at the crossroads of outer space application. The idea of concluding a legal instrument to stop the dangerous military use is wining more and more support and becoming an important step in assuring security in outer space for all.

CHALLENGES AND HOPES FOR OUTER SPACE NON-WEAPONIZATION

To be frank, it is a tough issue to deal with outer space weaponization by legal means. Since the 1980s, the international community has experienced a series of frustrating efforts, both multilaterally and bilaterally. The end of the Cold War provided no impetus to the Prevention of an Arms Race in Outer Space (PAROS) issue, and the ad hoc committee on PAROS

has not functioned since 1995. Three are at least three explanations for this situation:

1. **Political obstacles**. With the adjustment of the Strategic Defense Initiative by the United States and the shift of focus on the Comprehensive Nuclear-Test-Ban Treaty, the outer space issue has been marginalized. The re-emerged concern about the outer space issue has been confronted by considerable change in the strategic framework after the Cold War. The military super power is inclined to pursue security by exerting power rather than by an arms control approach, and military superiority has overwhelmed the idea of strategic stability; the desire for unilateral security has overwhelmed the interests of common security.
2. **Military temptation**. Advanced technologies are always used first in the military arena. Some military decision makers deeply believe that the control of outer space by one country requires the acquisition of multi-dimensional tactics and strategic military superiority. They believe that outer space will eventually be weaponized just like sea and air space. With these beliefs in mind, it is understandable why arms control in outer space is so difficult.
3. **Complexity of technology**. Outer space is a medium that is different in many aspects from land, sea and air space. The unique environment and the development of related technology are changing the traditional ideas on weapons and the way force is used. The definition of relative terms (such as outer space, outer space weapon, deploy, test and use of force) and verification of a future treaty is complicated. This in turn will be an excuse for certain countries to block related negotiation.

However, in spite of the political, military and technical challenges, there are some decisive factors that will attract all—including the developing and the developed—parties to negotiate a legal instrument on the outer space non-weaponization issue. Due to its unique physical nature, outer space cannot be owned by any individual nation; a peaceful outer space will benefit all, and a weaponized outer space will endanger the interests of all, especially those countries that most rely on the assets of outer space. In this outer space era, no country, including the first one to introduce weapons in outer space, is immune from the severe consequences if outer space is polluted by debris, since all space assets, no

matter whether civil or military, will certainly be at high risk of being damaged.

THE CHARACTERISTICS OF SPACE SYSTEMS AND SPACE BEHAVIOUR

In the discussion about outer space non-weaponization, the following questions are frequently asked: what is an outer space weapon? What is a weapon component or weapon system? How can we deal with an Earth-based weapon with the potential of entering space? What kind of behaviours could be regarded as use of force? What are the criteria of outer space weaponization? In the environment of outer space, the generally accepted answers can only be given after clarifying the characteristics of space systems and space behaviour.

First, most space systems have a dual-use nature. It is generally believed that any man-made space object with manoeuvrable capability has the potential to be used as weapon. Some space systems are exclusively designed for war fighting; some systems for civil purposes can be transferred to military or weapon uses at wartime. Some space-based components that are supportive systems for civil or general military purposes at peacetime can be used for war fighting purposes. In addition to the civil–military and general military–war fighting dual-use nature, there is also an Earth–sky dual-use nature. Some Earth-based weapons are designed exclusively for outer space strikes; some Earth-based systems have anti-satellite (ASAT) potential.

Second, the nature of outer space behaviours is also hard to define in the environment of outer space. Like space weapon systems, many behaviours have a dual-use nature. Different definitions may lead to different legal implications. Take the use of force as an example. The typical way of using force is to destroy something by collision, explosion or directed energy, but in the outer space environment, use of force may take exotic forms. Various non-traditional ways to impose harm on an enemy's outer space assets are currently being debated, including de-orbiting, jamming, curtaining and other soft killing measures that can temporarily halt space assets' functions. If these non-violent behaviours are conducted at peacetime, it is difficult to determine whether military strikes occurred or not. If they have occurred, military reaction may be triggered; if not,

compensation for intentional or unintentional damages should be compensated.

Knowledge of the above-mentioned characteristics of outer space systems and behaviours is important for determining which systems and activities should be prohibited, limited and permitted.

A LEGAL FORMAT FOR OUTER SPACE NON-WEAPONIZATION

The legal system works by regulating behaviours and related matters. To prevent outer space weaponization, outer space behaviours and weapon systems are two key elements that should be examined. Given the complexity of weapons and behaviours related to outer space, it is appropriate to address different weapon systems with different legal norms. Prohibitive, restrictive and permissive measures should be created respectively for different systems and behaviours according to their relation with outer space weaponization. Generally, prohibitive norms should be applied for weapons designed exclusively for outer space use and obvious military action against, in and from outer space. For weapons with the potential of being used in outer space, space systems with the potential of being used as weapons or behaviours with a dual nature, restrictive measures should be imposed. For other outer space systems that are designed exclusively for peaceful and ordinary military uses, permissive norms should be applied. Regarding behaviours, any form of force in space should be prohibited. And some dangerous behaviours that may harm the space assets of other nations should be restricted as well (see Table 1).

Table 1: Analysis of weapon systems and the applied norms

	Norms applied			
Weapon systems	**Prohibited**	**Restricted**	**Permitted**	**Remarks**
Space-based weapon	▲			
Space-based dual-use system		▲		War fighting role should be prohibited
Earth-based weapon against space	▲			

	Norms applied			
Weapon systems	**Prohibited**	**Restricted**	**Permitted**	**Remarks**
Earth-based weapon with counter space potential		▲		Space strike should be prohibited
Space-based military operation supportive system at wartime	▲			
Space-based military supportive system at peacetime		▲		War fighting potential should be prohibited
Civil and commercial system			▲	
Military strike in, against and from outer space	▲			So called "soft killing" should be included
Military operation support in space	▲			
General military support activities in space			▲	
Dangerous behaviours could possibly harm outer space assets of other nations		▲		Activities in the vicinity of outer space assets should be prohibited
Civil and commercial application			▲	

DRAWING LINES: A COMPREHENSIVE APPROACH OR A PARTIAL ONE?

A critical question must be answered before lines can be drawn between outer space weaponization and reasonable military uses: What kind of activities could be regarded as outer space weaponization? In reality, there are a variety of systems and activities related to outer space

weaponization. When deciding the areas that future legal instruments should cover, political acceptability and technical feasibility must be taken into account. A balance between the prohibited and the permitted activities should be carefully addressed. In this regard, there are two approaches that should be addressed: a comprehensive approach and a partial approach.

COMPREHENSIVE APPROACH

In the comprehensive approach, all activities that may possibly lead to weapon deployment or military conflicts in space should be covered, including the activities conducted on the Earth and in outer space, in the beginning stages of weapon research and development, testing and production, and in the later stages of deployment and use. It is not only a weapons ban, but also an activities ban (see Table 2). The following items should be included:

Weapons and its components:

- space-based weapons, including kinetic and directed energy weapons;
- Earth-based weapons, including kinetic and directed energy ASAT weapons;
- Earth-based weapons with counter space capability, including missile defence systems;
- space-based weapon components that are exclusively responsible for target tracking identifying, guiding and striking, such as laser reflector or Space Based Infrared System-Low; and
- space-based weapon platforms, including spacecraft exclusively designed for harbouring weapons or dual-use space vehicles.

Activities related to outer space weaponization:

- research and development of relative weapons;
- flight tests of relative weapons;
- Earth deployment of relative weapons;
- space deployment of relative weapons; and
- use of force in or against outer space.

Obviously, this is an ideal but too ambitious solution to outer space weaponization issues. There are too many terms and grey areas to be defined. Considering the contemporary political and scientific situation, to

conclude such a comprehensive legal instrument would be a time consuming process.

Table 2: Comprehensive approach to outer space weaponization

	Weapon activities									
	Research & development/ production		Testing		Deployment		Normal use		Used as weapon	
Weapon systems	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
Space-based weapons		▲		▲		▲		▲	–	–
Land-based weapons for space missions		▲		▲		▲		▲	–	–
Space-based weapon components		▲		▲		▲		▲	–	–
Land-based weapons with potential for space missions	▲		▲		▲		▲		–	–
Space-based general military support systems	▲		▲		▲		▲			▲
Space-based civil systems	▲		▲		▲		▲			▲

PARTIAL APPROACH

The partial approach does not pursue a comprehensive ban on all outer space weapons and related activities; instead, it focuses on the issues and areas that could possibly make a breakthrough in stopping the imminent threat of outer space weaponization (see Table 3).

A ban on specific behaviours could be one solution, including two key activities that should be prohibited:

- no deployment of weapons in outer space; and
- no use or threat of use of force in outer space

Table 3: Partial approach to outer space weaponization

	Weapon activities									
	Research & development/ production		Testing		Deployment		Normal use		Used as weapon	
Weapon systems	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
Space-based weapons	▲		▲			▲		▲	–	–
Land-based weapons for space missions	▲		▲			▲		▲	–	–
Space-based weapon components	▲		▲		▲			▲	–	–
Land-based weapons with potential for space missions	▲		▲		▲		▲		–	–
Space-based general military support systems	▲		▲		▲		▲			▲
Space-based civil systems	▲		▲		▲		▲			▲

The Conference on Disarmament (CD/1679) working paper *Possible Elements for a Future International Legal Agreement on the Prevention of the Deployment of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects* put forward by China, the Russian Federation and five other nations on 27 June 2002 is an attempt at the partial approach.

Different from the comprehensive approach, the joint working paper advocates an end-control strategy, holding the last line in stopping outer space weaponization while temporarily putting other issues aside. The

proposal is designed to slide over some tough issues such as definition and verification, so as to make a breakthrough possible.

Another recommendation is a weapons ban, including ASATs and space-based weapons. The idea of an ASAT ban has been proposed since the early 1980s; proposals on space-based weapons ban are more recent initiatives. These efforts attempt to cover the entire process of research and development, testing, production, deployment and use of outer space weapons. Just like the comprehensive approach, it seems difficult to accomplish. Moreover, there is a causal relationship between different systems; it is illogical and impractical to prohibit certain categories of weapons while permitting others.

Of course, the joint working paper should not be regarded as providing the perfect solution, as it is more of an activities ban than a weapons ban. Neither does it deal with the initial stages of weaponization such as weapons research, development and testing or provide a detailed definition of the term "use of force". Nevertheless, the paper covers the key points of preventing outer space weaponization, meets the most urgent needs and could serve as a platform to hold valuable proposals together. Significantly, both China and the Russian Federation have indicated that the proposal is open for further development.

CONCLUSION

Although there are different views on outer space weaponization among nations, most of them agree that there is no weapon in outer space at present. Thus, this is the window of opportunity. If this opportunity is missed, the world community will pay a high price for its negligence.

Many valuable proposals have resulted from the approaching danger of outer space weaponization. Although each of these proposals has its own perspective and emphases, most of them deserve serious consideration as long as they advocate positive steps toward the non-weaponization of outer space; however, it would be better if these proposals were more integrated and practical.

Of course, there is no simple solution to the problem of outer space weaponization, which bears so much security and development interest to

nations. The development of science and technology brings challenges to outer space issues, especially when the legal system is involved. In the space era, more and more countries will acquire the capability of entering outer space and more and more activities will be conducted in outer space. As a matter of principle, all countries have the equal right to use and enter outer space, and the prevention of outer space weaponization is just a way to protect this right.

Finally, it should be pointed out that no panacea exists in the contemporary world. There will always be something that even laws cannot resolve. Self-restriction and mutual trust are also important, and the common interests of humankind in outer space will be a driving force for all countries to come together to find a solution that makes outer space use more reasonable and peaceful.

CHAPTER 7

LEGAL FOUNDATIONS AND ESSENTIAL TREATY ELEMENTS FOR A SYSTEM OF COMMON SECURITY IN OUTER SPACE

Detlev Wolter

INTRODUCTION

In this paper, I present the concept and the essential elements for a treaty of common (cooperative) security in outer space. Both are based on extensive research, which I published in June 2003 in Germany in a monograph entitled *Common Security in Outer Space and International Law*; the United Nations Institute for Disarmament Research has published an English version. I began my research in 1983 as an intern in the Department for Disarmament Affairs when US President Ronald Reagan made his Strategic Defense Initiative (SDI) speech.

There is an urgent need for a comprehensive space security order that starts with a space arms control regime and also encompasses positive elements of cooperative space security such as confidence-building measures, rules of the road, international verification as well as institutional structures. The need for such a preventive arms control regime cannot be overemphasized. As Jonathan Dean, former ambassador and adviser on international security issues for the Union of Concerned Scientists, puts it in his endorsement of my forthcoming book:

> … humanity is on the verge of an irreversible shift to active, destructive, military use of outer space, a global revolution in human security which will almost certainly surpass in significance the introduction of nuclear weapons.

FOUNDATIONS OF COMMON SECURITY IN OUTER SPACE (CSO)

INTERNATIONAL LAW: OUTER SPACE TREATY (OST) AND UNITED NATIONS GENERAL ASSEMBLY RESOLUTIONS ON THE PREVENTION OF AN ARMS RACE IN OUTER SPACE (PAROS)

Both the OST and PAROS contain several essential principles that could serve as the foundation for a CSO treaty.

Use of outer space exclusively for peaceful purposes and in the common interest of all states and mankind as a whole

Outer space is a common territory beyond national jurisdiction, the global commons *par excellence*. In addition, the OST provides for cooperation and consultation principles. Hence, security cannot be pursued in the interest of one state or a group of states. Instead, it must be common or cooperative security.

The legal order for outer space that exists today was developed in close cooperation with the international community's efforts to prevent the space powers from entering into an arms race in space. From the beginning of the space age, the international community raised the claim that the exploration and use of outer space shall be used exclusively for peaceful purposes in the interest, and for the benefit, of mankind as a whole. The United States and the Soviet Union introduced the principle of peaceful use in proposals aimed toward developing a legal order that would limit the military use of outer space. In its first memorandum devoted to arms control in outer space to the General Assembly in 1957, the United States proposed that the United Nations should establish a multilateral control system with "international inspection and participation" as "the first step toward the objective of assuring that future developments in outer space would be devoted exclusively for peaceful and scientific purposes".

The obligation to prevent the weaponization of space

The deployment of space weapons would clearly not be in the "interest of all states" and would thus violate Article I of the OST. While the international community has accepted passive military uses of outer space,

such as reconnaissance and communication satellites, it clearly opposes the transgression of the threshold toward active uses of outer space of a destructive nature. Since 1981, the annual resolutions of the General Assembly regarding outer space and the prevention of an arms race in outer space have repeatedly requested that the nuclear powers actively participate in the prevention of an arms race in outer space "with a view to reaching agreement" as well as to restart or speed up parallel bilateral arms control negotiations concerning outer space and refrain from any contrary activities.

At the 59th First Committee meeting of the United Nations in 2004, Sri Lanka declared the PAROS resolution, in substance, to be customary international law. In addition, the General Assembly in several PAROS resolutions stated explicitly that the Nuclear Non-Proliferation Treaty (NPT) disarmament obligation also applies to outer space. As the International Court of Justice has stated in its Advisory Opinion in 1996, there is an obligation to conclude and not only to negotiate a disarmament agreement.

THE CONCEPT OF COMMON SECURITY ("GEMEINSAME SICHERHEIT"– EGON BAHR/HANS DIETER LUTZ)/COOPERATIVE SECURITY (BROOKINGS INSTITUTION)

The origins of the concept of "common security"

Given the capability of mutually assured destruction, security can no longer be achieved against, but rather with, opponents. In this sense, common security is already a reality. The recognition that in the atomic era peace and security can only be guaranteed cooperatively, and that war as the continuation of politics by other means has been replaced by the absolute "futility of war" lies at the heart of the concept of "common" or cooperative security. In his speech before the United Nations First Special Session on Disarmament in 1978, German Chancellor Helmut Schmidt marked the starting point of the development of common security by introducing the notion of "security partnership". The concept received international recognition with the Palme Commission's report in 1982 on common security stating: "Security in the nuclear age is common security". The report was welcomed in the same year through Resolution 37/99 of the General Assembly, which emphasized the central role of the United Nations "in furthering common security", and mandated the Disarmament

Commission to examine the recommendations with a view to its efficient implementation.

In a similar vein, German Foreign Minister Joschka Fischer spoke before the General Assembly on 14 September 2002 under the *Leitmotiv* of the need to establish a "system of global co-operative security", declaring it to be a "central political task of the twenty-first century".

The structural elements of "common security"

The main elements of "common security" were developed by Hans Dieter Lutz and Egon Bahr, former minister of state of the German Foreign Ministry, as well by the Brookings Institution under the notion of "cooperative security" in the following five categories:

1. Cooperative de-nuclearization

The defensive reorientation of military–strategic forces allows for the drastic reduction and eventual abolishment of nuclear weapons. Thus, the concept contributes to the fulfilment of the nuclear powers' disarmament obligation according to Article VI of the NPT, as reaffirmed by the International Court of Justice.

2. Structural non-provocation and defensive configurations

Structural non-provocation implies that military forces should be organized and equipped in a way that would not permit a successful military attack. Cooperative de-nuclearization is strengthened in a mutually reinforcing way by establishing force postures that are structurally incapable of supporting a nuclear attack.

3. Internationalization of the response to an aggression

While the restructuring of the military capabilities toward an exclusively defensive configuration, buttressed by arms control regulations, would offer a maximum degree of international security, it could not be excluded that in circumventing the agreed rules a particular state would secretly develop an offensive capability. Therefore, as part of a reassurance system, the right to self-defence in the framework of a collective security system remains necessary.

4. Restraints on military investment and proliferation

5. Transparency and confidence-building measures

A central part of common security, which has to be understood as a process, is the multilateralization and possible institutionalization of transparency and confidence-building measures.

A MULTILATERAL AGREEMENT FOR A CSO TREATY

PRECURSORS

The proposal for a CSO treaty builds on the numerous treaty proposals of Member States, the work of the PAROS Ad Hoc Committee (before it was discontinued) and the UN group of government experts in 1990 (Argentina, Brazil, Bulgaria, Canada, China, Egypt, France, India, Pakistan, the Russian Federation, the United States and Zimbabwe) on confidence building in outer space, as well as on the important academic and non-governmental organization contributions regarding PAROS.

The most comprehensive suggestions for an encompassing security order to safeguard the peaceful uses of outer space come from the group of government experts mandated by the General Assembly to work out proposals for confidence-building measures in outer space. In its report, the group suggests, inter alia, the following measures to be agreed by the Conference on Disarmament (CD) and the Committee on the Peaceful Uses of Outer Space:

- transparency measures concerning dual-use technology to secure its use for exclusively peaceful purposes;
- multilateral use of satellite remote sensing in the interest of the international community, as well as the creation of an international early warning system concerning accidents in outer space;
- "rules of the road" including safety margins between space objects;
- use of space technology for preventive diplomacy, crisis management and peaceful settlement of conflicts; and
- establishment of an International Satellite Monitoring Agency, an International Space Monitoring Agency and a world space organization to promote confidence building and cooperation in outer space in such

issues as remote sensing, environmental monitoring, crisis prevention and forecasts of natural catastrophes.

MULTILATERAL AGREEMENT ON A CSO TREATY AS A SPECIALIZED AGREEMENT TO IMPLEMENT THE OST IN THE FIELD OF SECURITY

Principles of a CSO treaty

Taking into account the recommendations of the report of the Palme Commission on common security and the report of the United Nations group of government experts on confidence-building measures in outer space, a CSO treaty should contain the following principles:

1. Common/cooperative security

A CSO treaty is based on the concept of "common security" in outer space. It implements the obligation of the OST on the use of outer space in the area of security in the interest of mankind. At the same time, it buttresses the necessary nuclear strategic transition toward mutually assured security in an adequate multilateral framework, which the nuclear powers have to set in place in order to fulfil their disarmament obligation under Article VI of the NPT. The concept of common security must be complemented by specific strategic elements going beyond the classic confidence-building measures. In particular, the multilateralization of the American–Russian "cooperative threat reduction" programmes would lay the groundwork for a global system of cooperative threat reduction and an effective non-proliferation regime.

2. Delimitation between general provisions on cooperative security and specific nuclear–strategic questions

It is necessary to distinguish between general provisions on cooperative security and specific issues of nuclear strategy, where the main responsibility for filling the cooperative security structures lies undoubtedly with the three major nuclear powers and potential opponents: China, the Russian Federation and the United States. Therefore, with regard to a "new strategic framework" and a "cooperative strategic transition", it would be difficult to regulate these issues in detail in a multilateral CSO treaty. Such a far-fledged multilateralization of nuclear–strategic questions would hardly be acceptable to the nuclear powers. As a beginning, it should suffice to provide the general principles and procedures regarding the necessary

interface of these issues with the general security interests of the international community, including a flexible institutional arrangement, for example, limited membership in a standing consultative committee.

3. Transparency, confidence building and strategic confidence measures ("strategic reassurance measures")

A CSO treaty is based on the principles of transparency and confidence building in the use of common space with the security interests of mankind as a whole. It thus complements existing confidence-building provisions in the OST and the Registration Convention in particular by introducing a "pre-launch registration" and on-site inspection of launch sites as well as new strategic confidence-building measures such as "strategic reassurance measures" and further cooperative security elements for outer space in the form of immunity and traffic rules for satellites.

4. Structurally non-offensive force configurations, cooperative strategic transition and nuclear disarmament

Structurally non-offensive force configurations, whereby armed forces are organized and equipped in such a way that does not permit military offensive actions in outer space, means that no active military uses of space could be permitted. A structurally non-offensive force configuration in outer space is thus best achieved by an explicit prohibition of active military uses of a destructive nature, that is, a space weapons ban. It would also contribute to structurally non-defensive force configurations and nuclear disarmament on Earth by facilitating the effort to overcome the strategy of nuclear deterrence.

A CSO treaty creates the necessary conditions for a cooperative nuclear strategic transition. The strategic change would thus be implemented in accordance with the clause of the OST that affirms the creation of common security for all states in the interest of mankind and guarantees at the same time that outer space will remain free of weapons. By limiting the number of intercontinental ballistic missiles in accordance with Article VI of the NPT, the risk of unauthorized and accidental attacks would be considerably restrained, and thus the necessity of space-based defence systems further reduced. The treaty, therefore, leads in the long term to complete nuclear disarmament, to be monitored by cooperative verification including reliable on-site inspections in particular.

5. Preventive arms control through a ban on active military uses of outer space

According to an expert report submitted to the German Bundestag, the creation of cooperative structures and political cooperation alone would not suffice to prevent an arms race if they were not complemented by preventive arms control measures for technological development, which are of particular importance regarding space technology. The development of space weapons would trigger both a quantitative and especially a qualitative arms race. Completely new and unforeseeable arms control and non-proliferation problems would arise with the continuous advancement of new technologies and applied physics principles, which preventive arms control could effectively shut off. By creating legal clarity as to the prohibition of the development, production and deployment of space weapons, the treaty would prevent a new arms spiral in both variants in keeping with the objectives of preventive arms control. Although a ban of development and production of space weapons might be too ambitious, an explicit prohibition of the deployment of space weapons in a multilateral treaty would be very effective in slowing down, if not stopping altogether, the development of space weapons.

6. Principle of equality

Respecting the principle of equal security according to the UN Charter (Article 2, Paragraph 1) would mean more than merely adhering to a formal legal aspect of a CSO treaty. The main purpose of the treaty would be to prevent the sharpening of inequalities in security, which would arise by a transgression to active military uses of outer space, by setting up a system of common, that is, equal security.

Main elements of a CSO treaty

Most of the essential elements of a cooperative security system in outer space have already been proposed in one form or another to the CD or in bilateral American–Soviet/Russian arms control treaties. Therefore, the main task ahead is to combine the individual elements in a mutually reinforcing manner to build a coherent cooperative security system. In particular, the principles of a CSO have to be developed in terms of both substance and procedure with regard to the destruction of existing anti-satellite (ASAT) capabilities/arsenals, the protection of civil space objects and passive military uses of a non-destructive nature and monitoring and verification as mechanisms of implementation control.

State parties should commit to being guided in all of their military space activities by the principles of transparency and confidence building as proposed by the UN group of government experts. A CSO treaty would also facilitate strengthening and possibly extending the various control regimes for missile technologies and weapons of mass destruction, including regulating the transfer of sensitive technologies by, inter alia, enhancing and extending the current Missile Technology Control Regime and the International Code of Conduct against the Ballistic Missile Proliferation (ICOC). The use of multilateral satellite monitoring could encourage those states that might acquire ballistic missile technology to join such control regimes. An incentive to do so would be the prospect of possible access to space technology for civil space activities offered under the common security regime.

State parties should commit to conducting space activities in a way that is compatible with the principle of structurally non-provocative and non-offensive force configurations. A consultative committee could be set up to further develop procedural details. In addition, the state parties should commit to conforming all military activities in outer space to the objectives of non-proliferation and disarmament according to Article VI of the NPT.

Under the cooperative framework, the development of a limited (land- and air-based) National Missile Defense (NMD) system to combat ballistic missiles in the boost phase ("boost-phase NMD") that would renounce the deployment of any space weapons could be considered, ideally under international control. The tasks of such a system should be enumerated and thus limited to protecting against unauthorized and accidental missile launches and against missile attacks in violation of the non-proliferation regime for ballistic missile technology and weapons of mass destruction. The implementation of the system would have to be secured by a multilateral monitoring and verification mechanism. In addition, a standing consultative committee should work out the details of such a consensual NMD deployment.

A central provision of a CSO treaty should be the explicit prohibition of active and destructive military uses in outer space in order to achieve the necessary legal clarity with regard to the implementation of the principle of the peaceful uses of outer space. This principle would thus be confirmed and specified through a ban on space weapons, namely by explicitly banning space-based ASAT and Ballistic Missile Defense (BMD) weapons.

Canada has rightly stated that without a general space weapons ban, the prohibition of the use of force would also protect the deployment of space weapons. Such an outcome would run counter to the community purpose of the peaceful use of the common space.

Concerning a prohibition of space weapons, in particular a ban on space-based ASAT and BMD systems, five issues need to be tackled:

1. Definition: the issue of so-called "non-dedicated systems", that is, the delimitation between prohibited ASAT systems from permitted civil space objects that could be misused, such as through collision or docking, in an ASAT function.
2. Verification: especially given the possible residual ASAT capability of "non-dedicated systems", an effective international verification is necessary including of missile launch pads *in situ*.
3. Applicability of the prohibition in the case of conflict.
4. Verifiable destruction of existing ASAT capabilities, which should also be complemented by limiting the number of military satellite launches.
5. Immunity of satellites: an explicit prohibition of ASATs should also ban non-space-based ASAT systems and thus guarantee the complete protection of all peaceful satellites.

A CSO treaty stipulation prohibiting space weapons could read as follows:

> The state parties commit themselves to refraining from any deployment or use of any object in space or on Earth *that was designed or modified specifically for the purpose to inflict permanent physical damage on any other object through the projection of mass or energy respectively*. In particular, the deployment of BMD and ASAT systems in outer space are prohibited.

Such a prohibition of active military uses of outer space corresponds to the requirements of a cooperative approach on the NMD issue. Thus, numerous American studies have shown that China and the Russian Federation would view a space-based NMD system to intercept warheads in mid-course in outer space as destabilizing rather than cooperative. An explicit prohibition of space-based BMD systems, with the exception of non-destructive sensor satellites, is indispensable to not only safeguard the principle of the peaceful uses of outer space as a prerequisite for a CSO, but

also to permit the necessary cooperative approach with regard to the nuclear–strategic and arms control questions raised by the NMD.

Existing ASAT systems have the capability to destroy satellites only in near-Earth orbit. The strategically important satellites used for early warning, navigation and precise guidance systems are stationed in the geosynchronous or in other high-Earth orbits, and are thus considered not yet at risk. However, near-Earth orbit satellites fulfil important functions in crisis situations such as photo reconnaissance, ocean surveillance and electronic intelligence. Furthermore, as in the Gulf War, they deliver real-time intelligence to all military operations. In a crisis situation, the fear that an opponent may destroy one's satellites can provoke an "irresistible temptation ... to remove such satellites from the sky". It is, therefore, necessary to encourage the destruction of existing land- and air-based ASAT systems not only as a matter of congruence with the prohibition of space-based ASAT systems, but also to safeguard the security in outer space in crisis situations.

The creation of an immunity regime for civil space objects and satellites with passive military tasks of a non-destructive nature would be an important part of the confidence-building measures. By determining the range of the satellite uses protected under the immunity regime, the necessary legal clarity as to the admissibility of these uses would be achieved. Some believe that the prohibition of the use of force would be sufficient to protect existing satellite uses. This, however, does not take into account the fact that a number of states have voiced doubts as to the admissibility of even the existing passive military uses. This concerns, in particular, the use of satellites as precise guidance systems for nuclear weapons. An immunity regime is all the more necessary as the dual-use capabilities of most satellites may cause civil space objects to become targets of interference or attacks by ASAT weapons in a crisis situation.

An immunity regime for satellites, which would be specified by "rules of the road" in the framework of a "space code of conduct", would be an important contribution to "traffic security" in the near-Earth and geostationary orbit. An important element of such traffic rules would be to respect certain security distances as well as provisions to avoid collisions, which would also become necessary for environmental protection against increasing space debris.

A CSO treaty would contain appropriate mechanisms for implementation control through multilateral monitoring and verification of the protection regime and the ban on space weapons, including the immunity rules for space objects used for peaceful purposes. By having access to satellite reconnaissance, such a space weapons agreement could be reliably verified. The range of possible verification measures spans from the classic "national technical means" (that is, national military reconnaissance satellites) to both "passive cooperative" and "active cooperative" verification such as on-site-inspections in the form of "continuous monitoring", "invitational inspections" or "challenge-inspection" (anytime–anywhere inspection).

In addition to a "space-to-Earth-verification", outer space has a peculiar requirement for "ground-to-space" and "space-to-space" verification methods. To monitor the proposed protection regime for civil space objects such as safety margins, a "space-to-space" verification seems indispensable. "Space-to-space" verification could also be used to monitor a space weapons ban, and for this purpose could be complemented by inspections of missile launch pads *in situ*. The satellites used for this type of verification could, according to Bhupendra Jasani, a renowned military and arms control expert, ideally form "multilateral technical means". In the meantime, civil and commercial satellites have also reached a technical stage capable of supporting verification.

The use of satellites for international verification, whether through an international verification agency's satellites or by having verification data and imagery of national satellites at its disposal, would pave the way for general international verification for bilateral and multilateral arms control, non-proliferation and disarmament treaties. The monitoring and verification mechanism of a CSO treaty could thus also be used for monitoring the compliance of further arms control and non-proliferation treaties, in particular the Comprehensive Nuclear-Test-Ban Treaty and the NPT as well as for crisis prevention purposes.

Appropriate international fora for negotiating the agreement

The issue of military uses of outer space has taken on significance for all future space activities. Active military uses of outer space would have considerable repercussions on the safety of civil and particularly commercial uses of space. Furthermore, the impact of such a transgression

on international security in terms of nuclear strategy, the relationship between defensive and offensive weapons and the entire bilateral and multilateral arms control, non-proliferation and disarmament regimes, makes it necessary to comprehensively treat the issue from all angles. Therefore, the convocation of a separate international state conference under the aegis of the United Nations to negotiate a CSO treaty would seem to be appropriate. Such a multilateral conference of plenipotentiary state representatives could potentially break the impasse at the CD by negotiating the necessarily comprehensive treaty with sufficient authority to offer new advantages of a comprehensive security order that would be, in particular, beneficial to the space powers with regard to their civil space uses. This agreement should, as with the OST and the specialized space agreements, be approved by the General Assembly for its adoption by the international community. National reconnaissance offices and the numerous international scientific organizations dealing with space and disarmament issues should be included at an early stage in the process.

On 5 February 2001, Canada reaffirmed its commitment to convene a review conference on the OST with the objective to negotiate an additional protocol regarding the military use of outer space. The proposal for a CSO treaty, as an implementation agreement of the OST, could be tabled at such a conference.

Common security in outer space as a means to overcome nuclear deterrence

The nuclear–strategic objective of common security is to replace the deterrence strategy of "mutual assured destruction" by "mutual assured security". Thus, it matches President Reagan's goals pursued under SDI, and the goals that are currently linked to the introduction of strategic defence systems in the framework of a "strategic transition". A US national defence against ballistic missile attacks could render nuclear weapons obsolete, thereby causing nuclear offensive weapons to become superfluous. The main difference, however, is that the concept of "common security" attempts to achieve this by cooperation and structural change, whereas the proponents of a space-based missile defence view this as the result of technological developments in the form of new defensive systems in outer space. Yet, the scientific consensus is quite clear: there can be no absolute security by technical means.

Overcoming deterrence through a new relationship between offensive and defensive systems and eventually abolition, however, is only possible in a cooperative environment. The recognition by the nuclear powers of the necessity to cooperate in order to achieve security lies at the heart of the concept of common security; its realization would renounce new armaments in outer space and on Earth.

The concept thus constitutes an ideal basis for a cooperative nuclear strategic transition that would allow the fulfilment of the nuclear disarmament obligations according to Article VI of the NPT, and that would free mankind of the scourge of nuclear terror. Common security opens the perspective for genuine disarmament by establishing non-provocative structures on all sides through defensive configurations. In the words of the late Hans Dieter Lutz:

> Common security requires the replacement of the deterrence strategy by a strategy of prevention renouncing any measures of preemption and retaliation (in particular with weapons of mass destruction).

A strategic transition toward cooperation is also a prerequisite of an active non-proliferation policy. Developing a multilateral CSO treaty could facilitate the cooperative transition from Mutual Assured Destruction to Cooperative Threat Reduction programmes.

US Senator Richard Lugar, one of the co-authors of the cooperative threat reduction programmes, rightly demands a globalization of them. This is only possible in an adequate multilateral framework. Similarly, Europe has strengthened efforts to make the ICOC multilateral by including a greater number of states with missile technology, in particular, China, India, Iran, Israel and Pakistan. An extension of these programmes alone, however, would not suffice to overcome nuclear deterrence since all measures need to be additionally embedded in a comprehensive system of common security.

The interest of mankind clause under international space law demands that common security interests take precedence over national or bilateral security interests, thus opening the chance for the international community to overcome nuclear deterrence by requiring compliance with the principle of cooperation and the nuclear disarmament obligations under Article VI of the NPT, which also applies to outer space.

CHAPTER 8

APPROACHES TO REGULATING WEAPONS IN SPACE

Nancy Gallagher

The current rules regulating space activities were originally developed when the technology was new, the number of space users was small, and future uncertainty was high. The space security environment has changed dramatically since the 1967 Outer Space Treaty, raising questions about which uses of space should now have priority and how they should be protected. The Bush Administration's approach amounts to deregulation of military space activities in the expectation that US military power will be able to protect and promote US interests in a more competitive arena. I will argue, however, that the increased complexity in the space security environment strengthens, rather than undermines, the case for mutual restraint and protective regulation based on equitable rules, agreed operating practices and increased transparency.[1]

In the early years of the space age, the United States worked hard to gain international agreement to a set of formal and informal rules that increased predictability and helped protect those uses of space that it deemed most valuable. The overarching objective of US space policy during the early decades of the Cold War was to develop and legitimate reconnaissance satellites and other military support systems that helped stabilize deterrence, while preventing the Soviet Union from using space in ways that the United States neither wanted to pursue nor would concede to its rival.

The Outer Space Treaty codified the key principles upon which the original space security system was built, including free access, non-appropriation, equitable benefits and peaceful use. It explicitly prohibits only a few military uses of space—i.e. weapons of mass destruction in orbit and military activities on celestial bodies. The treaty tacitly legitimates the use of space for surveillance (which the Soviets had denounced as

espionage until the early 1960s) and is silent about other space-based military support activities. It clearly states, however, that all uses of space must be "in accordance with international law, including the Charter of the United Nations".[2]

The Outer Space Treaty's rules were reinforced by a number of other agreements, including the 1963 Limited Test Ban Treaty's injunction against nuclear explosions in space, the prohibition on space-based missile defence found in the 1972 Anti-Ballistic Missile (ABM) Treaty, and the protections for "national technical means" of verification in numerous arms control accords. Although the superpowers never explicitly outlawed anti-satellite (ASAT) weapons, the United States pursued a policy of reciprocal restraint with the Soviet Union and neither superpower made a serious effort to deploy a significant ASAT system or space-based weapons that could strike targets on Earth.

The US preference for a mix of formal regulations and informal restraint on space weapons reflected four hard-headed calculations about US security:

1. Space weapons were technologically challenging, expensive, vulnerable and offered the United States few—if any—advantages over land-, sea- or air-based systems for most military missions.
2. If the United States deployed space weapons, the Soviets would follow suit, so the advantage for the United States would be short lived, whereas if the United States exercised restraint the Soviets would reciprocate or take an incremental step that the United States could quickly counter.
3. The United States was more dependent on space than the Soviet Union was, so it had more to lose if attacks on space assets were legitimized.
4. Most military uses of space, such as arms control verification and early warning, helped to stabilize deterrence and should be protected, whereas the deployment of space-based weapons and other anti-satellite capabilities would create destabilizing incentives for pre-emptive attack.

Starting in the late 1970s, several developments began complicating efforts to provide predictability and protect peaceful space activities though a mix of general principles, a few explicit prohibitions and a large amount

of voluntary restraint. The strategic context shifted from stable mutual deterrence to concerns about possible nuclear warfighting, then to a post-Cold War era without clarity about whether the new strategic principle should be cooperative threat reduction or hegemonic coercion. Major advances in space-related technologies, including high resolution remote sensing, precision navigation, data management and miniaturization, increased the importance of space for military, civilian and commercial users. They also blurred the distinction between "benign" and "threatening" uses of space. The number of independent space powers increased significantly, but the spending and capabilities gap between the United States and all other countries widened even more. Finally, deregulation and privatization produced a sizeable commercial space industry. The use of space went from being monopolized by a small number of governments to being widely accessible through private companies to countries and organizations that lacked independent space capabilities of their own.

None of these developments automatically reduces the relevance of the Outer Space Treaty. It was deliberately written as a foundation document whose basic principles would remain valid and valuable when space was being widely used for a variety of purposes by both state and non-state actors. In practice, however, it has been difficult to have sustained discussions, let alone to reach agreement, about how the existing rules should be applied to the new situation, and what, if any, new rules are needed to balance interests and protect high-priority space activities. Although annual UN General Assembly resolutions on the Prevention of an Arms Race in Outer Space (PAROS) document near universal diplomatic support for steps to reinforce the Outer Space Treaty and further regulate military uses of space, the United States has been especially resistant to negotiations on the topic both in the Conference on Disarmament (CD) and in the UN Committee on the Peaceful Uses of Outer Space (COPUOS). This resistance reflects a deep scepticism about arms control's ability to provide either predictability or protection, and a philosophical conviction that deregulation in the military sphere of space activities will free the United States to maximize its competitive advantage.

Unlike most other space-faring countries, the current US administration believes that the global spread of space capabilities translates directly into growing threats against US space assets. It also assumes that self-help is the most reliable form of protection. The Bush Administration

has sought to maximize its freedom of action by withdrawing from some agreements (the ABM Treaty), interpreting others very narrowly (the Outer Space Treaty), and opposing negotiation of any new restriction on military space activities. The United States still professes its commitment to the peaceful uses of space, but US military planning documents now assert that peace is best protected by unilateral space dominance—i.e. having the ability to see anything in and from space, to attack anything that is deemed dangerous, to defend all US space assets, and to control other countries' access to and use of space.

This approach to space security is fundamentally at odds with the principles and commitments in the Outer Space Treaty.[3] It is of grave concern to the rest of the world, and would also be controversial in the United States if the American public realized that such a radical reorientation of US space security policy was underway.[4] This is one reason why the Bush Administration has kept the issue out of the spotlight by quietly reinterpreting ambiguous language in the Clinton-era presidential space directive rather than spelling out its own presidential-level space policy. In effect, the Bush Administration is trying to change the facts on the ground in ways that favour expanded US military uses of space while avoiding any serious national or international assessment of the interests at stake.

The most immediate result of the new approach has been to shift US space priorities in ways that favour military uses of space over scientific and commercial ones and that impede international cooperation on a range of space-related issues. If the United States continues to expand its military space capabilities and doctrine while resisting international efforts to discuss the limits of legitimately "peaceful" use, it could eventually stimulate threats that do not currently exist, yet would have neither effective legal and diplomatic tools for managing those dangers nor reliable unilateral military protection.

The US quest for military space dominance is based on a distorted conception of the security challenges created by the global spread of space capabilities. Documents such as the 2001 Rumsfeld Commission report argue that the United States must move quickly to develop offensive and defensive space weapons if it wishes to avoid a "Space Pearl Harbor".[5] Most near-term problems, such as space debris, orbital slot allocation and space traffic management, however, neither reflect hostile intent nor are

amenable to military solutions. Upon closer examination, some anecdotes used to document present dangers turn out to be coordination problems that respond to diplomatic solutions (for example, one incident of alleged jamming was actually due to an orbital slot allocation dispute that was resolved peacefully). Other "evidence" involves no real threat to US satellites (Iraq jammed US military global positioning system receivers, not satellite signals, and the jammers were destroyed without space weapons) or unsubstantiated assumptions about dual-use capabilities (i.e. allegations that a Chinese microsatellite is being developed for "parasitic" or "killer" purposes). The United States is the only country currently developing ASATs and other space weapons, although other countries are capable of doing likewise should they decide to emulate or offset some of the advantages that the United States military attributes to its space capabilities.[6]

If the space security environment envisioned by the Rumsfeld Commission actually developed, the United States would be best positioned to compete since it currently accounts for the vast majority of global military space expenditures.[7] That does not mean, however, that the United States military could provide reliable and cost-effective protection for its own satellites, let alone those of allies or third parties. Most US space weapons efforts are still at an early stage in the development process, and significant technical challenges remain even after decades of work. Despite sharp budget increases, projected US spending on military space activities falls far short of what would be required to achieve complete offensive and defensive space dominance.[8] Even if the United States were willing to spend significantly more to achieve space dominance—an unlikely prospect given the costs of war in Iraq and mounting concerns about the budget deficit—other countries could interfere with uses of space that they find intolerably threatening while still spending only a fraction of the US military space budget. Since offence tends to be easier and less expensive than defence in space, all space services could be denied or disrupted at a fraction of the cost and technical expertise required to perform them in the absence of protective rules.

The United States should be using its leadership position in space to strengthen protective rules and cooperative mechanisms for managing space security. Indeed, changes in the space security environment actually reinforce the reasons why the United States originally wanted a system of rules and mutual restraints in space, not a no-holds-barred realm of competition.

- Technological change is occurring across the board, not just in space, so it remains true that space weapons offer few, if any, advantages for most military missions.
- Technological diffusion means that if any country deploys space weapons, others will quickly emulate or offset them, so the advantage to the initiator of a world in which space was just another arena for military competition would be short compared with the benefits of rules limiting military uses of space and protecting peaceful space activities.
- As the world's "sole superpower", the United States still has the most to lose if attacks on space assets are legitimized since its economy and military are most heavily dependent on space assets.
- Because the United States is so far ahead, it can afford to exercise restraint knowing that other countries have even less incentive or ability to suddenly surge ahead of the United States than the Soviets did during the Cold War.

Until the United States recognizes the continued applicability of this logic and returns to its traditional support of international efforts to protect peaceful uses of space through legal order and mutual restraint, other countries will have to fill the leadership void. I do not believe that like-minded countries should attempt an "end run" around the United States by repeating the "Ottawa Process" that negotiated the Anti-Personnel Landmine Convention because no country's central security concerns can be addressed without the constructive involvement of the United States. It should be possible, however, to find a creative solution to the current impasse in which COPUOS is not allowed to take up issues related to space weapons because that is the CD's business, but the CD is blocked from holding discussions about the topic because it lacks consensus on a general programme of work. At a minimum, a coalition of like-minded countries could demonstrate their seriousness of intent by suspending diplomatic turf battles long enough to hold a meeting that would bring together delegates to the CD and to COPUOS to discuss practical problems such as space debris that cut across their jurisdictions. Since most space-related technologies have both peaceful and military applications, it could be fruitful to promote dialogue between these two communities even if not all space-faring countries were initially represented.

One can easily envision the basic outline of a more ambitious set of rules for regulating military space activities to protect legitimate activities

while providing reassurances about how those activities will operate and how their benefits will be shared. Any such effort should reinforce the Outer Space Treaty, not raise questions about its legal status, rewrite the treaty in ways that required re-ratification, or reopen basic principles in an attempt to negotiate a single comprehensive outer space convention under difficult diplomatic circumstances.

The first step would be to make fuller, more explicit use of the Outer Space Treaty's provisions. For example, US Air Force lawyers are trying to legitimate any military activities not explicitly prohibited by Article IV of the treaty by asserting that "various unopposed military uses of space may as a practical matter enlarge the unofficial definition of 'peaceful purposes' to the point that specific arms control agreements may be the only effective limitation on development and deployment of various weapons in space."[9] It is important to write a diplomatic and legal record of international opposition to those military uses of space that do not involve weapons of mass destruction or military installations on celestial bodies but still go far beyond the passive military support activities that have historically been accepted as stabilizing. For example, Article III's requirement that all uses of space must be "in accordance with international law, including the Charter of the United Nations" could be used to request an advisory opinion from the International Court of Justice on the legality of any offensive military space activities not authorized by the Security Council as necessary to maintain or restore international peace and security. If the US military ever actually started trying to exercise unilateral control over other countries' access to and use of space, it would violate Article I's freedom of use principle. Moreover, any military space activity that generated debris or other potentially harmful interference with other countries' use of space would be grounds for international consultation under Article IX. Of course, lodging a protest or requesting a consultation would be largely symbolic because the Outer Space Treaty does not include much in the way of verification, compliance management or enforcement. Still, symbolic protests are better than nothing when silence is being misconstrued as consent.

One or more companion agreements to the Outer Space Treaty would have several reinforcing elements. A categorical prohibition on the testing and deployment of dedicated space weapons, including anything designated as an ASAT weapon and any weapons stationed in space that could hit targets on Earth, would make a valuable normative statement.

Since many space technologies have both benign and threatening applications, though, a ban on weapons in space would need to be coupled with measures to address "latent" or "residual" ASAT capabilities. For example, any missile defence system could be used offensively. It would make sense to prohibit space-based missile defence interceptors because they are at a very early stage of development, offer relatively little protective benefit at great expense, and could be used offensively against satellites in geostationary orbit that would otherwise be out of reach. Unless the United States can be persuaded to forego all missile defences, however, one would also need a general injunction against any form of attack or deliberate interference with legitimate satellite operations. Likewise, concerns about microsatellites should be addressed by combining a general prohibition on aggressive uses with reassuring behavioural rules and restrictions on specific capabilities where the peaceful benefits are not worth the suspicion and risks of misuse.

Prohibitions on threat or use of force against peaceful space activities will require more explicit international agreement about which military support activities are truly peaceful and thus deserving of legal protection, and which are not. Many supporters of the PAROS approach want to focus, at least initially, only on weapons that project force in, from and to space, on the grounds that space-based military support systems are so sacrosanct for the United States as to preclude productive discussion. It is worth giving some thought to the broader question, though, because of a problem called the "paradox of ASAT arms control"—i.e. if legal measures are used to suppress ASAT attacks on vulnerable satellites, then countries will be tempted to deploy more threatening spacecraft and incentives to develop ASAT capabilities will increase, thus undermining the effectiveness of legal restraint.[10] Therefore, reliable restraints on attacks against or interference with satellites require corresponding restraint and reassurance about the uses of those satellites.

This raises a number of challenging questions that merit serious discussion among those who believe that additional regulation of space weapons would be useful. Should the objective be a categorical ban on threats and use of force against outer space objects, or should one try to specify from the outset that protection requires peaceful use, and if so, how should peaceful use be defined? Would there be a presumption that all military support satellites are peaceful during peacetime and lose their protected status during wartime, or are there types of military support

activities that should be either banned as dangerously destabilizing during peacetime or protected as mutually beneficial for crisis management and conflict termination even during a war? What about satellites that provide services to both combatants and civilian users or neutral countries? None of these are easy questions, so it is better to start working now on answers that balance the full range of interests at stake than it is to cling to a false dichotomy between "good" military support satellites and "bad" space weapons.

Creative thought is also needed to avoid another false dichotomy about whether the details of verification should be addressed before or after agreement on the principles for regulating military uses of space. Discussions about verification of new limits on space weapons are already falling into counterproductive Cold War patterns: arms control opponents claim that verification problems preclude further restrictions; some proponents want to postpone discussion of verification until after legal commitments have been made; and self-styled pragmatists suggest that willingness to agree in advance on verification is evidence of sincerity or lack thereof.

A more constructive approach would be to identify specific ways in which a greater willingness to exchange information about space-related activities would have immediate practical benefits in making those activities safer, cheaper or more effective, and would also increase confidence about compliance with rules regulating military space activities. For example, states that want greater international cooperation on space security could start by ensuring that their own submissions to the UN Convention on Registration of Objects Launched into Outer Space are complete, accurate and timely since all space users have a common interest in avoiding space traffic collisions and clarifying questions about the purpose of satellites. Likeminded states could also discuss pooling resources to develop a global system for detecting and tracking satellites, space debris and other objects, ideally in collaboration with the US space surveillance network, but independently if it proved impossible to agree on equitable rules for sharing information and allocating costs.[11] New life could be give to information-sharing projects such as the Joint Data Exchange Center (JDEC) and the Russian-American Observation Satellite (RAMOS) first proposed as a way for the United States and Russia to overcome Cold War suspicions if they were recast as steps toward building the level of confidence and operational

cooperation among all space-faring countries needed for global space security.[12]

Of course, it is hard to have forward progress even on modest forms of cooperation, let alone on the core problem of regulating military space activities, when the most powerful country is actively pursuing military space dominance in support of a national security strategy based on coercive prevention. Luckily, there are good reasons to believe that technological challenges, budgetary constraints and domestic politics will eventually have a moderating effect on US space security policy. In the meantime, other countries should not let US intransigence on PAROS be an excuse for inaction on things that they can influence. Anyone who wants new regulations on space weapons should make sure that they are fulfilling all national obligations under existing international agreements and should play a constructive role in the development of rules and information-exchange mechanisms on related issues, such as space debris and space traffic management. Instead of trying to repeat the Ottawa Process, likeminded countries should consider whether nascent projects on global Earth monitoring and space surveillance might be opportunities to replicate the "Galileo Process" in which a growing number of states made progressively stronger commitments as the functional benefits of cooperation became clearer. These secondary forms of cooperation should neither be dismissed for failing to place new constraints on space weapons nor be allowed to substitute for serious discussion of the larger problem. Instead, they should be integrated into a coherent strategy to change the facts on the ground in ways that favour space security cooperation by demonstrating the continued relevance of the basic principles in the Outer Space Treaty and their practical application in protecting legitimate space activities in an increasingly complex environment.

Notes

1 This presentation reflects work funded by the John D. and Catherine T. MacArthur Foundation and was undertaken in collaboration with John Steinbruner, Jeffrey Lewis and Martin Malin. The observations in this presentation are developed more fully in Nancy Gallagher, "Towards a Reconsideration of the Rules for Space", *CISSM Working Paper*, April 2005, at <www.cissm.umd.edu/documents/gallagherspace.pdf>.

2 *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, Article III.

3 See Ram Jakhu, "Legal Issues Relating to Global Public Interest in Outer Space", *CISSM Working Paper*, October 2005, at <www.cissm.umd.edu/documents/jakhuspace.pdf>.

4 When presented with arguments for building or banning space weapons, though, Americans overwhelmingly preferred the latter approach. See Steven Kull, "Americans on WMD Proliferation", CISSM/PIPA/Knowledge Networks poll, 15 April 2004, at <www.pipa.org/onlineReports/WMD/WmdReport_04_15_04.pdf>.

5 *Report of the Commission to Assess United States National Security Space Management and Organization* (The Rumsfeld Commission), Executive Summary, 11 January 2001, at <defenselink.mil/pubs/spaceintro.pdf>.

6 Jeffrey Lewis, "Programs to Watch" and "False Alarm on Foreign Capabilities", *Arms Control Today*, vol. 34, no. 9 (November 2004), pp. 12, 14–17.

7 Some estimates place the US share of global military space expenditures as high as 95%, but it is notoriously difficult to compare military budgets of such dissimilar countries as the United States, Russia and China. See "Government Space Budgets Continue to Grow", *Spacedaily.com*, 11 December 2003, at <www.spacedaily.com/news/satellite-biz-03zzzl.html>.

8 For example, US Air Force Space Command has estimated that the cost of acquiring all the capabilities for which it is responsible would be almost double the available resources in the next decade. See Air Force Space Command, "Strategic Master Plan FY06 and Beyond", 1 October 2003, p. 13.

9 For example, see Elizabeth Waldrop, "Weaponization of Outer Space: U.S. National Policy", *High Frontier*, Winter 2005, pp. 36–37.

10 Ashton Carter, "Satellites and Anti-Satellites: the Limits of the Possible", *International Security*, vol. 10, no. 4 (Spring 1986), p. 68.

11 Currently, only the US military has a significant capability to track space objects, but there are problems with its coverage and concerns about data availability. A number of other countries have partial capabilities that could be combined and expanded into a more comprehensive and reliable space surveillance system if they had a compelling reason to do so. See Theresa Hitchens, *Future Security in*

Space, Washington, DC, Center for Defense Information, September 2004, pp. 53–62.

12 On the potential significance of JDEC as a step toward security arrangements based on reassurance rather than deterrence or coercive prevention, see John Steinbruner, "The Significance of Joint Missile Surveillance", *Occasional Paper of the Committee on International Security Studies*, American Academy of Arts and Sciences, July 2001, at <www.cissm.umd.edu/documents/jointmissile.pdf>.

CHAPTER 9

SOME CONSIDERATIONS ABOUT THE VERIFICATION ISSUE OF PREVENTING OUTER SPACE WEAPONIZATION

Duan Zhanyuan

Nearly half a century has passed since humans first entered outer space. With the rapid advancement of space technology, how to prevent outer space from becoming a new arena for the arms race after land, sea and air has drawn wider and wider concern from the international community in recent years. What is more, the policy of pursuing "space control", the continued development of ballistic missile defence technology and the deployment of ballistic missile defence systems all further arouse people's worry about possible outer space weaponization.

As the fundamental legal instrument governing outer space activities, the 1967 Outer Space Treaty (OST) has serious loopholes in preventing outer space weaponization. As a matter of fact, due to the rapid advancement of space technology, people's knowledge and recognition of outer space inevitably has been an ever increasing and deepening process: the important role that outer space now plays in the social development of mankind was far beyond the imagination of people in 1957 when Yuri Gagarin from the former Soviet Union first went into outer space; and the challenges that outer space now faces were unpredictable to people 10 years later in 1967 when the OST was concluded. So, it is no surprise that the OST has loopholes, which simply reflects the evolving degree of people's knowledge of outer space.

Until now, though no consensus has been reached in the international community as how to address the serious challenges that outer space faces, adopting legal and diplomatic approaches have more and more become a common point of agreement. Outer space weaponization is a threshold that cannot be crossed at will, since once weapons are deployed in outer space, the status quo of outer space will be severely and irreversibly damaged and

lead to a new round of the arms race, with harm to strategic stability and social development that cannot be overestimated. It is apparent from the history and experience of nuclear disarmament how difficult it is to limit a new weapon once it is developed much less control it or perhaps prevent its proliferation, let alone completely eliminate it. In 1985, Jayantha Dhanapala, the then ambassador for disarmament affairs of Sri Lanka, noted that preventing an arms race in outer space "is an easier task than attempting to control and decelerate such a race after it has begun". Though 20 years have elapsed, his insight still has significance today. Fortunately, no weapon has ever been deployed in outer space, which offers us an opportunity to address this important issue.

I want to take this opportunity to present my personal views concerning preventing outer space weaponization and will focus on the specific issue of verification.

Since the 1980s, many countries have put forward a number of proposals, suggestions and views concerning the verification issue, among which the non-paper *Verification Aspects of PAROS* on 26 August 2004 by the Chinese and Russian Delegations to the Conference on Disarmament is the latest addition. The verification measures contained in these proposals and suggestions fall roughly into two categories: space-based remote-sensing surveillance and Earth-based on-site inspections.

With the development of science and technology, outer space is becoming increasingly transparent and remote sensing with optical, infrared, radar, electronic and other technologies is well within the reach of many countries. However, as more and more space objects are potentially dual-use, the capabilities of a verification system to discriminate between permitted satellites and prohibited space weapons would be very limited.

On the other hand, on-site inspection carried out on launch-sites would be more effective and relatively inexpensive, because all space objects, including potential space weapons, are launched from the Earth. Germany, the Russian Federation, Sweden and several other countries have contributed their ideas about on-site inspections. For example, forming an international observer team and dispatching permanent observers to each space-launching site to ensure that no weapons will be deployed in outer space is a good idea. Germany further suggested that pre-launch on-site inspection, if accepted, would make other verification measures

unnecessary. Clearly, the key point is whether space-faring countries would accept this highly intrusive approach.

Effective verification measures are indeed very important to enhance the confidence of each and every state party to a treaty. During the Cold War, many treaties and agreements, especially many bilateral nuclear disarmament treaties—for example, the Intermediate-range Nuclear Forces and the Strategic Arms Reduction Treaty—all have relatively complete and very strict verification provisions. However, the outer space issue is quite different in essence.

As no weapon has ever been deployed in outer space, the endeavour and the intended different measures are all preventive in nature. Lloyd Axworthy, former minister of foreign affairs of Canada, also mentioned the necessity of preventative diplomacy in addressing outer space issues in his speech at a seminar held in Beijing in 2002. Thus, it seems that the political will of the space-faring countries to prevent outer space weaponization is a crucial factor. Outer space is a high-tech matter and only a small number of countries have mastered the technology to varying degrees; only one country is pursuing "space control" and a "space dominance" doctrine in which a programme of placing weapons in outer space could be included. The fact is that the political will of the international community, especially the single country with the intention of placing weapons in outer space, would play a fundamental role in preventing outer space weaponization.

In reality, the OST is largely a preventive treaty. Although it lacks a verification mechanism, the OST is very effective regarding implementation. Its loophole lies in that it covers only weapons of mass destruction, and without a verification mechanism it has never been an issue of serious concern for nearly 40 years.

From a purely technical point of view, though verifying weapons deployed in outer space is possible and feasible, the difficulties that may be encountered are still very challenging. If we can reach consensus on preventing outer space weaponization on the basis of common political will, then other relevant and perhaps contentious issues, such as the verification mechanism, will be relatively easier to resolve. As mentioned above, the on-site inspections of launch-sites would be much more effective, easier and inexpensive. Joe Clark, former minister of external affairs of Canada, speaking before the United Nations General Assembly on

24 September 1986 stated that “verification is not just a question of technical capacity but of the political will to reach agreement on the application of technologies and techniques”.

However important formulating a perfect and ideal treaty with verification provisions is, preventing outer space weaponization is our real goal, and the urgency of negotiating and concluding a legal instrument is without doubt. Otherwise, should our task become one of limiting, controlling and even eliminating outer space weapons, the consequences would be unimaginable and the costs too high. Considering the current situation, I think that we need to deal with the issue of verification with a more open attitude, but the issue itself should not be an obstacle to concluding a legal instrument preventing outer space weaponization.

CHAPTER 10

ADEQUATE VERIFICATION: THE KEYSTONE OF A SPACE-BASED WEAPON BAN[1]

Phillip J. Baines

I plan to take a circuitous route in this paper, but by the end of it, I hope to have demonstrated the necessity of adequate verification provisions for a space-based weapon ban. In doing so, I also hope to have dispelled the notion that unwillingness to expend political capital, technical difficulties or high monitoring costs need necessarily impede the adoption of verification measures for an increasingly urgently needed non-proliferation regime for outer space. In fact, improved space situational awareness means that are necessary to engage from space in military intelligence terms could very well enable the negotiation of a space-based weapon ban as a preferred risk management strategy for safeguarding space security.

On a prior occasion when I spoke about the deleterious consequences of waging conflict in outer space, I faced a vocal sceptic challenging me as to whether a space-based weapon ban would enhance the national security of a major military power that is increasingly reliant upon the secure use of outer space for its national security. This person believed that "the weaponization of outer space is all but inevitable" based on the last 40,000 years of human history. I instead argued that since the establishment of the United Nations after the Second World War, and with humanity still facing the imminent prospect of nuclear annihilation, civilized men and women have worked steadfastly to build collective security for all nations through international legal regimes. These treaties have placed universal, equitable and verifiable constraints on the behaviour of both the great and the small powers for application in times of peace as well as in times of war.

In deciding these important matters, we should be willing to turn to rigorous objective rational thought to analyse the merits of extending

military conflict into outer space. The great Chinese general Sun-Tzu once wrote: "Warfare is the greatest affair of state, the basis of life and death, the Tao to survival or extinction. It must be thoroughly pondered and analysed."[2] There is no analysis more objective than that of mathematical logic and it is this stream of thought to which I turn in order to demonstrate the aforementioned conclusions.

The achievements of humanity's great mathematicians have been developed from the foundation of a few axioms—fundamental truths that cannot be proved or disproved, but whose fundamental essences are acknowledged to be true. Upon this foundation, towering theorems of mathematics have been developed by the strictest rules of logic. No proposition can be accepted as true without a rigorous proof. A proposition so proved then becomes an established theorem. These theorems then enable the further proof of far more complex propositions.

Several methods of mathematical logic have been developed to establish proofs of propositions, but no method is as elegant as the method of contradiction, and it is this method that I will use to "prove" that it is really a space-based weapon ban that is inevitable. In doing so, it will become apparent that verification is the keystone of any arms control agreement, including one for outer space. Even in the absence of an arms control treaty for outer space, it will be further established that technology, funding and political capital will eventually coalesce to develop the national technical means necessary to verify a suitably framed arms control agreement for outer space. Improved space situational awareness means will present a low-cost, low-risk off-ramp from an arms race in outer space, and will thus serve to reinforce the likelihood of negotiating an arms control agreement banning weapons from outer space. After all, no state would rationally spend billions of dollars on weapon systems once it is recognized that the strategic advantage it thought it would gain through such an expenditure would quickly be lost to strategic parity, and once it was realized that the efficacy of defending satellites with weapons was likewise questionable given the vulnerability of these systems themselves to opposing weapons.

The method of proof by contradiction first begins with a proposition. The proof proceeds by assuming that the proposition is false or by assuming that the opposite of the original proposition is true. The proof then proceeds by presenting a line of argument that necessarily leads from this assumption

to a contradiction. Hence, the conclusion that the original proposition is false must be false or, in other words, that the original proposition must be true.[3]

Let me begin with the original proposition that I desire to "prove":

A space-based weapon ban is possible.

The proposed "proof" of this proposition is to be established by contradiction. Therefore, assume that the original proposition is false by declaring that its opposite is true:

The weaponization of outer space is inevitable.

I will now attempt to develop a line of argumentation that will establish that this second proposition is false.

If the weaponization of outer space is inevitable, then it is logically also true that no single nation will possess a monopoly on space-based weapons. I cite humanity's experience with nuclear weapons to support this conclusion. In 1945, the United States had a monopoly on the possession of nuclear weapons and by 1949 the Soviet Union had possessed its first nuclear weapon. This date was from 1 to 4 years earlier than some US intelligence analysts had predicted in 1946.[4] Then, in 1957, the Soviet Union launched the world's first artificial satellite and by 1961, the United States had followed suit. History therefore demonstrates that asymmetric advantages are quite fleeting when the subject concerns technological development in support of national security.

This leads to an argument that outer space is of the same order of strategic importance for states in the twenty-first century as nuclear weapons were to states during the twentieth century, if only because of the great utility of outer space for the prosecution of both conventional and nuclear war on the Earth. I am supported in this assessment by the fact that outer space best enables the use of information technology to support mobile, global military operations on the Earth, whether conventional or nuclear. According to Bruce Berkowitz in 2003:

> Today the ability to collect, communicate, process and protect information is the most important factor defining military power. In the

> past armour, firepower, and mobility defined military power, but now it often matters less how fast you can move or how much destructive force you can apply. Stealth trumps armour, precision trumps explosive force, and being able to react faster than your opponent trumps speed . . . to defeat your opponent you must first win the information war. You can do this by making your own information systems more capable, reliable, and secure, or by attacking your opponents systems so that they are less capable, less reliable, and less secure.[5]

The global reach and relatively secure access provided by outer space makes it the preferred location to build the information networks necessary to win the information wars of the twenty-first century. Consequently, the doctrine of exercising "space control", "space superiority" or "space dominance" today will be as strong an impetus as holding the "fatal terrain" at the time of Sun-Tzu:

> In general, whoever occupies the battleground first and awaits the enemy will be at ease; whoever occupies the battleground afterward and must race to the conflict will be fatigued. Thus one who excels at warfare compels men and is not compelled by other men.[6]

Given the clear strategic importance for any great power of securing the use of outer space for itself and denying it to its adversaries, and given the dire consequences that would similarly be borne by any other great power willing to cede this fatal terrain to a rival, it is logical to conclude from humankind's nuclear weapon experience that:

> Any initial space-based weapon deployment will face off against an opposing space-based weapon deployment.

At first, space-based weapons could be directed at negating current satellites that supply crucial information to military missions on the Earth. Current military force support systems in outer space, such as reconnaissance, navigation and communications satellites, are not weapons in themselves, but nevertheless the ability to negate these targets can at first blush appear to be profitable in denying an opponent access to the information it needs to prosecute a modern war. Subsequently, however, once space-based weapons targeted on orbital military assets are deployed opposite one another, opposing military strategists will also be forced to develop counterforce space-based weapon systems, lest an adversary's

deployment of similar counterforce space-based weapon systems secure a significant military advantage for that opponent. This demand to find and negate an opponent's space-based weapons before that opponent finds one's own weapons, together with the fragility and vulnerability of one's own satellites and space-based weapons to such negation weapons, will force the development of an ability to discriminate a weapon system deployed in outer space from a non-weapon system deployed in outer space.

This ability to discriminate targets in outer space will also quickly develop because:

- the moral constraints of the Laws of Armed Conflict militate against a doctrine directing weapons indiscriminately at counter-value targets;
- there is no advantage to be gained from the stalemate represented by parity in strategic weapons; and
- one's own space-based weapons will be vulnerable to a first strike by an adversary's counterforce space-based weapons.

Prospects in this regard will therefore echo those found during the Cold War with first-strike nuclear counterforce weapon systems, such as the Soviet SS-18 Satan and the American MX Peacekeeper intercontinental ballistic missiles. In the absence of prior agreed constraints, this posture would become necessary for weapons in outer space, just as it was for nuclear weapons on the Earth, in order to limit dire consequences of allowing counter-value targets to remain at risk of destruction by counterforce weapons maintaining freedom of action to attack. Ergo,

> It will become possible to discriminate space-based weapon systems from non-weapon space-based systems.

This ability to discriminate a weapon from a non-weapon space-based system will be further assured by the development of national space situational awareness means to ascertain the threats to orbital assets supporting currently accepted military uses of space—the navigation, remote sensing and communications satellites necessary to support military operations on the Earth with global, time-critical information. These national technical means could also be needed both to protect current assets from harm through reinforcing the capabilities of non-offensive defences and to guard against the emergence of space-based weapons that

could threaten internationally accepted military uses of outer space. Given the strategic importance of outer space, I contend that the necessary human, technical and financial resources will be devoted by all of the major space-faring states to obtain the ability to know what is going on in outer space to a degree of certainty sufficient to identify the emergence of new military threats against satellites and against facilities, forces and other military assets on the Earth.

In addition, it is also possible to portray the development of such space monitoring assets as pre-cursors to a terrestrially-based anti-satellite system as a further military hedge against an adversary populating a constellation of orbital weapons designed to suppress all launches into outer space, whether ballistic missiles or space launch vehicles, or to negate critical satellite functions involved in the sensor-to-shooter decision cycles of modern military conflict. Twenty-first century military conflict is increasingly focused on winning the observation, orientation, decision and action (OODA) loops through the use of global, high-speed information networks. The victor in any modern military conflict will be the state whose OODA loop is faster and more secure than the OODA loops of any other state. In doing so, the development of these national space situational awareness technologies will further serve as a demonstration of resolve by states to possess the targeting means to deny sanctuary to any future space-based weapon system.

During the Cold War, however, then-President Ronald Reagan directed that the United States would be willing to negotiate an arms control agreement for outer space if three conditions could be satisfied. First, any arms control agreement must be in the national security interests of the United States; second, it must require equitable obligations on all participants; and third, it must be effectively verifiable.[7] These rational criteria are still suitable for use by all states in their own national security calculus. Let us deal with them in reverse order.

If it is possible to discern a weapon from a non-weapon deployed in outer space, then it is also logical to deduce that:

> A treaty banning the deployment of weapons in outer space is adequately verifiable.

This is known to be true because simply by using the surveillance means that would otherwise be necessary to wage conflict in outer space to determine that all space-based objects are in fact not weapons can discern the absence of a weapon. A standard of verification equal to the standard needed for armed conflict in outer space should be sufficient, since both defence- and arms control-oriented solutions for safeguarding space security seek to ensure that no nation gains a consequent military advantage over others. This standard is termed adequate verification and differs from effective verification in that its objective is to be sufficiently robust to deter all cheating as opposed to detecting all possible forms of cheating. Adequate verification is focused on detecting militarily significant incidents and not every minor non-compliance with a treaty.[8] In short, adequate verification is the same standard used to discern a military threat based on capability as opposed to discerning a political threat based on intent.

It now becomes possible to conclude further that the ability to discriminate a weapon from a non-weapon space system, given concerns over the possibility of a pre-emptive attack on satellites, will also lead to an ability to establish the absence of space-based weapons at any point in time, including the time prior to the entry into effect of a universal treaty banning the testing, deployment and use of space-based weapons. To the best of anyone's knowledge at the present time, no nation has operationally deployed a long duration space-based weapon. Hence:

> The initial absence of space-based weapons would impart equal obligations on all state parties to a universal treaty banning the testing, deployment and use of weapons in outer space.

The national security interests of a state party to an arms control agreement stands as the last test to be surmounted and it is here that I resort to the principles of risk management—a well-known practice in the affairs of state. Risk, as it is understood in the context of risk management, is defined as the probability of an event occurring times the consequence of that event occurring. The probability is a number between zero, representing impossibility, and one, representing certainty. The consequence can be expressed as the unbounded cost needed to restore the situation to a state prior to the occurrence of the event. These two variables are independent of one another. The probability of an event can be low and yet risk can be quite high because the value of the consequence can be very great. A terrorist detonating a nuclear weapon is one such

example of a low-probability but a high-consequence event. Conversely, a highly probable event with low consequence does not necessarily constitute a significant risk. A terrorist with a belt of conventional explosives stands as an example of a high-probability but a relatively low-consequence event, considered at a national level (discounting psychological impact).

The probability of an event occurring is equated to the threat in the context of a threat analysis. The variable threat is defined as the product of intent times capability of an opponent. Both intent and capability variables range between zero, representing no intent or no capability, and unity, representing certain intent or full capability. Intent and capability are again independent variables, since an opponent can be all bluff and no capability, or all capability and little inclination. If an opponent can be assessed to be all intent and little capability, the threat can be judged quite low. If a state consists of all capability but little intent, as in the case of a military ally, the threat can also be judged quite low. If an opponent has little intent and little capability then the threat is of even less of a concern than that of the first two cases.

When this threat equation is inserted into the equation for risk, it is clear that a low threat will always reduce risk regardless of the value of the consequence. Said differently, a high consequence does not necessarily equate to a high risk because the threat can be quite low. The benefit of an arms control treaty now becomes obvious. Despite the reliance of any great power upon space-based assets to conduct its terrestrial military operations on the Earth (amounting to high consequence), the verified absence of an opponent's space-based weapon (little capability) positioned within the confines of a universally adhered to treaty (little intent) produces a risk that is comparatively low. In the absence of a treaty, the consequence variable remains high; capability can also be high as there is no legal constraint to prohibit the testing, deployment and use of space-based weapons by any state; intent can also be high because an opponent must also hedge against the unconstrained intent of its rival in addition to seeking its own strategic advantage.

A numerical example might help to illustrate this conclusion. Suppose that a powerful state has 100 active satellites in orbit and that each of these satellites is worth US$ 250 million. The consequence for conflict in outer space is therefore valued at US$ 25 billion. This enormous figure includes neither the cost of launching the replacement satellites, nor the cost of

removing space debris from orbit after a conflict (assuming that it is possible to do so), nor the cost of replacing lost information from other sources (if any). Suppose now the intent to do harm by an adversary is one, or absolute certainty, and that this adversary has developed, tested and operationally deployed space-based weapons, so capability is also assessed as being equal to unity. Then, in the presence of these weapons, the risk equals one times one times US$ 25 billion, or simply US$ 25 billion. Alternately, imagine that a state wishes to use its own space-based weapons to defend some of these satellites from other weapons and that its defence system is as effective as the average of prior Soviet and US anti-satellite testing results, or 75%. The risk has now been reduced to US$ 6.25 billion or just 25% of the original ante. Of course the belligerent state might also be exposed to a comparable risk from the defending state.

In contrast, consider the opposite case of an arms control agreement that bans the testing, deployment and use of space-based weapons. Intent, expressed as a proportion of states outside the agreement, might now be reduced to 10%, a number in the same range as the proportion of states outside the Non-Proliferation Treaty. The probability of a weapon capability could also be as low as 10%, based on a 90% confidence level goal for verifying the absence of weapons. (This confidence level appears, for example, to be borne out by the United Nations Monitoring, Verification and Inspection Commission's investigations and conclusions on Iraqi weapons of mass destruction.) Under this scenario, the risk could be as low as US$ 250 million. This amount is 1% of the full risk scenario, or 4% of the limited defence scenario above, and it does not encumber any national treasury with the cost of developing, deploying or maintaining weapon systems in outer space—the most expensive domain in which to operate military systems. Instead, an arms control strategy only seeks to use a verification system equal to the monitoring system that would be needed in any event to ascertain the threat to a state from any other state's space activities (therefore representing little or no additional expenditure). The arms control approach would also sharply reduce the risk of generating space debris that could threaten the sustained use of outer space for the support of military and other operations.

Contrasting the above scenarios clearly illustrates that the risk is significantly lower with a universal, adequately verified arms control agreement prohibiting an entire class of weapons from a pristine domain. This analysis also does not include the further benefits accruing to the use

of non-offensive defences, which equate to protection measures as understood in the context of risk management.[9] This simplified analysis generates the penultimate conclusion that:

> It is in the national security interest of every state to prohibit the deployment of space-based weapons before the threat emerges.

Thus far in the "proof", the three criteria for a space-based weapon ban, established by an iconic former US president, appear to have been met. As the current US national space policy of 1996 echos these earlier three criteria for arms control agreements[10], one must conclude that:

> A space-based weapons ban is possible.

Given the contradiction of a conclusion that an arms control treaty banning the weaponization of outer space is possible with the converse premise that the weaponization of outer space is inevitable concludes the proof by contradiction.

> Quod erat demonstrantum (QED).

The key conclusion of this analysis is that the verified absence of a capability produces little risk regardless of the consequence or the intent. It is important to recognize from this analysis that risk tends to vanish as the capability tends to zero. This analysis also demonstrates that verification is the key requirement for the success or failure of a risk management strategy based on risk avoidance through an arms control agreement banning a whole class of weapons. In addition to the avoidance of risk based on a ban on capabilities, an arms control agreement with adequate verification provisions will also validate a low intent of the signatories to the agreement by detecting any militarily significant non-compliance early enough to elicit an appropriate response. This too will serve to reduce risk even further by deterring cheating or break-out situations. Available non-offensive protection measures for outer space can further reduce the risk of any state party's non-compliance with an agreement by lowering consequence through hardening and other measures. Adopting a diversification strategy for information technologies other than satellites will also decrease risk (just as the Internet remains robust against systemic failure by being based on a dispersed network of computers). By diversifying information network capabilities to include land, air and sea assets in addition to space systems,

a risk management strategy of coping with failures through creation of a failure-tolerant network will reduce risk and further diminish the need to protect space systems with weapons. This total risk management strategy, which is not based on weapons, accords with strategies of risk avoidance and risk protection. In President Reagan's era this calculus became expressed as "Trust, but verify".

Some opponents of the arms control approach seek instead to adopt risk transfer strategies and risk acceptance strategies through a reliance on weapons. Under classic risk management principles, risk transfer seeks to transfer the risk to other parties and risk acceptance strategies are strategies based upon simply coping with the attendant risk. Threatening an opponent's space systems with weapons in a deterrent posture is tantamount to a risk transfer strategy as one's own assets are "defended" by the threat of retaliation. This strategy also, however, results in higher risk because the certainty of weapons is always a more risky proposition than the uncertainty of an adequately verified absence of weapons. In addition, the simplified analysis above demonstrates that reliance upon active defence with weapons comes with an attendant higher consequence of accepting the risk because no defence is perfect. Finally, protecting satellites with escort weapons in outer space in no way addresses the greater risks to space systems and the electromagnetic links to and from satellites posed by the existing terrestrial threats of conventional weapons. In short, the verified absence of weapons is a less risky proposition than the defence of a capability through reliance on manifest weapons.

The analysis above also illustrates that, in the absence of an arms control agreement for outer space, lack of good will or trust among major space-faring powers will likely lead to the development of national technical means for intelligence collection to ascertain the space capabilities of rival states. The demonstrated consequence of ceding the "fatal terrain" of outer space to rivals in this analysis is so risky to the survival of states in the twenty-first century that great sums of money and vast amounts of effort will be spent on securing the technical and human means necessary to assess the threats to one's own space systems. These strategic needs will consequently bring about the necessary technologies, monies and political capital for space situational awareness assets that could (arguably better) be put to use verifying a space-based weapon ban. A space-based weapon ban enabled by improved situational awareness would present an attractive off-ramp for a fruitless arms race, whose most

probable end-state would be either the stalemate of strategic parity or high levels of uncertainty resulting from asymmetric responses.

Given that the absence of weapons in risk avoidance and protection strategies will result in lower risks than strategies based on risk transfer and risk acceptance using weapons, an arms control agreement for outer space becomes an increasingly likely means to safeguard space security. The calculus has been made obvious. What remains is whether Sun-Tzu's further wisdom will be recognized:

> If a general follows my [methods for] estimation and you employ him, he will certainly be victorious and should be retained. If a general does not follow my [methods for] estimation and you employ him, he will certainly be defeated, so dismiss him.[11]

Notes

1 The views presented in this paper do not necessarily represent the views of the Government of Canada or those of Foreign Affairs Canada.

2 Ralph D. Sawyer, 1994, *Sun-Tzu The Art of War*, New York, Barnes & Noble, Inc.

3 Peter J. Eccles, 1997, *An Introduction to Mathematical Reasoning*, Cambridge, Cambridge University Press.

4 Central Intelligence Agency, 1946, *Soviet Capabilities for the Development and Production of Certain Types of Weapons and Equipment*, Report number ORE 3/1–31 October, Washington, DC, Office of Public Affairs.

5 Bruce Berkowitz, 2003, The New Face of War, How War will be Fought in the 21st Century, New York, The Free Press, p. 21.

6 Ralph D. Sawyer, 1994, op. cit.

7 See *Presidential Directive on National Space Policy*, 11 February 1988, at <www.hq.nasa.gov/office/pao/History/policy88.html - 38k> that reads as follows: "The directive also states that the United States will consider and, as appropriate, formulate policy positions on arms control measures governing activities in space, and will conduct negotiations on such measures only if they are equitable, effectively verifiable, and enhance the security of the United States and its allies".

8 Charles A. Appleby and John C. Baker, 1992, Verification and Mobile Missiles: Deterrence, Detection, or Assurance?, in John. G. Tower,

James Brown and William K. Cheek (eds), *Verification: The Key to Arms Control in the 1990's*, McLean, VA, Brassey's, Inc.

9 Phillip J. Baines, 2004, Non-Offensive Defences: Space Protection without Space-Based Weapons, *Astropolitics*, vol. 2, no. 2 (summer).

10 Current US space policy as documented in the White House *National Space Policy: Fact Sheet*, 19 September 1996, at <www.ostp.gov/NSTC/html/fs/fs-5.html - 34k> that reads in part: "The United States will consider and, as appropriate, formulate policy positions on arms control and related measures governing activities in space, and will conclude agreements on such measures only if they are equitable, effectively verifiable, and enhance the security of the United States and our allies".

11 Ralph D. Sawyer, 1994, op. cit.

CHAPTER 11

ENGAGING THE RELUCTANT SUPERPOWER: PRACTICAL MEASURES FOR ENSURING SPACE SECURITY

Theresa Hitchens

It has now become crystal clear that the United States under the administration of President George W. Bush will not be persuaded to participate in any discussions, even indirect, of a treaty barring the weaponization of space. Indeed, with the release of a new National Space Policy in the spring of 2005, the strategy of conducting warfare "in, from and through space", as already envisioned by the US Defense Department and the US Air Force, will be codified at the highest level of national policy. The White House rewrite of US National Space Policy is expected to promote an aggressive pursuit by the military of the "space control" mission, in contrast to previous US policy to promote space control as a mission of last resort. And while the new policy is expected to put a priority on the use of "temporary and reversible" means of accomplishing this mission, it is not expected to rule out the possible use, even pre-emptively, of destructive methods of attacking satellites during hostilities, whether military, civil or commercial assets.

That said, it will take some time—decades even—for the United States to be able to implement such a policy. A major obstacle is that technology for space warfare remains in the research and development stage; a second major obstacle is likely to be the costs associated with development, deployment and maintenance of space weapon systems. This means that there is still time for an international effort aimed at limiting erosion of the norm against space weapons, and perhaps even to block the advent of the most destructive and dangerous types of weaponry—namely, destructive measures that would create space debris and put at risk the global use of space for future generations.

Such an international effort must focus in the near term on engaging the United States in areas where it is most directly and undeniably in the US national interest to cooperate with other space-faring powers, in hopes of sowing the seeds of understanding the value of a multilateral approach to space security. Concerted diplomatic and scientific effort needs to be put forth and in particular in endeavours designed to discourage the United States from pursuing destructive anti-space capabilities from a perspective that such weaponry would also endanger US interests.

The immediate opportunity for constructive engagement is in the arena of space debris mitigation. Space debris is a known hazard to operations in space. Even tiny pieces of debris can destroy a satellite. And space debris recognizes no nationality; it does not distinguish between military and commercial satellites or between enemy and friendly assets. As a result, the international community, under the auspices of the Committee on the Peaceful Uses of Outer Space (COPUOS) and the Inter-Agency Space Debris Coordination Committee, is seeking to implement a set of voluntary guidelines for all space-faring powers. There is some hope that COPUOS will accept the guidelines by 2007.

The National Aeronautics and Space Administration (NASA) has been a key player in developing and pushing for the international guidelines; and both NASA and the US Federal Communications Commission have instituted strong debris mitigation regulations governing US satellite operations. Even the US Air Force has expressed concern about space debris, declaring establishing space control guidelines via "temporary and reversible" means a priority, and opposing the US Army's ongoing Kinetic Energy Anti-Satellite project. Furthermore, the US Air Force fully complies with NASA regulations despite loopholes that would allow them to be waived for military efforts.

More encouragingly, some US Air Force officials further suggest that there might be room for discussions of multilateral methods or agreements to prevent the development, testing and use of debris-creating weapons. For example, Air Force Lieutenant Colonel Christopher Petras, chief legal counsel for international air operations for the North American Aerospace Defense Command (NORAD) and the US Northern Command, wrote in a 2003 paper,

> … a cursory review of relevant provisions of the law of armed conflict suggests that there is at least a foundation for dialogue with respect to an agreement that would prohibit the use of weapons that cause *widespread, long-term and severe* (emphasis added) contamination of the commons of space with debris.[1]

Petras bases his arguments on provisions such as whether a weapon system is "discriminatory" in its effects and on questions relating to damage to non-combatants.

Thus, it would seem that engaging the US government and military in discussions about debris-creating weapons and testing that might create dangerous debris is an open pathway. The Government of Canada might spearhead such a dialogue on the military side given the relationship between the two governments with regard to NORAD; NASA and European Space Agency officials responsible for debris observation and mitigation already routinely work together. While a regime preventing the testing and use of debris-creating weaponry obviously would be fraught with complexity (for example, one sticky issue might be the US pursuit of space-based missile defences), such a regime would go a long way toward ensuring the continued security of space operations by all space stakeholders and would address some of the most egregious negative repercussions of space weaponization. The members of the Conference on Disarmament could, and should, begin to explore the legal issues surrounding whether debris-creating weapons are consistent with the laws of armed conflict, and begin—perhaps simply in expert panels—examining the potential impacts of conflict debris.

Constructive US multilateral engagement also might be fostered in the related area of space surveillance. The US military and NASA both recognize that improvements need to be made in the capabilities of the US Space Surveillance Network, managed by the US Air Force. Efforts at improving sensor technology for finding and tracking space objects are ongoing, as are efforts to improve modelling and data manipulation to provide better analyses of the available space surveillance data. The need for better, more reliable space surveillance data to monitor debris and enable improved collision avoidance—as well as monitor asteroid approaches—is also well recognized at the international level and is the subject of international discussions in many fora including the International Standards Organization.

At the same time, security concerns have resulted in a new US process for sharing basic orbital data that previously were provided to the international community of space stakeholders for free by NASA via the Internet. The data-sharing process has been shifted to Air Force management under a programme called SpaceTrak, and concerns have been raised about restrictions implemented under that new programme. In particular, there are worrying signs with regard to limitations being placed upon how basic data—and the scientific analysis enabled by it—is redistributed and shared. The US community of scientists and space-watching hobbyists has already raised protests regarding the process, with some success in changing original Air Force plans. It is currently unclear how the new restrictions will affect international users of the data, spurring an urgent need for those users to begin discussing the issues with the US Air Force officials responsible for the process. The US Air Force is the only consistent provider of such data, moreover. The Russian Federation operates a similar, though less capable, space surveillance system and data bank, but does not routinely make its data publicly available. Europe has some space surveillance assets, but does not have an integrated network at the moment; China has a fledging programme, but it is reliant on US orbital data as a starting input. Therefore, it is difficult to see how continued improvement in surveillance techniques and capabilities at the international level can be achieved if the US data is significantly restricted.

Furthermore, there is widespread interest in improving satellite registration and launch data sharing as a way to underpin efforts to avoid collisions and ensure better tracking of space objects, both satellites and debris. All space-faring powers recognize the inadequacies of the United Nations satellite registry. For example, there currently is no requirement for operators to notify the registry when a satellite has been manoeuvred out of its initial insertion orbit—essentially meaning that the satellite can be lost to observers. In 2003, the Legal Subcommittee of COPUOS began a 4-year process to address registration problems and improve efficiency of the process,[2] in part spurred by US efforts that began in 2002 to overhaul and improve its own national process.[3]

Therefore, it seems that possibilities exist for dialogue with the United States about space surveillance requirements and efforts to improve capabilities. One goal of such dialogue might be the development of an international data bank that would provide all users with essential baseline data, but would allow the United States (or any other entity) to preserve

sensitive data. Certainly, improving transparency in space is of interest to all space-faring nations as well. In addition, an improved, and impartial, space surveillance network will be required in order to verify any future agreements on space weaponization or dangerous behaviour in outer space.

Finally, there are already ongoing discussions in various international industry and scientific fora—and interest by US industry—about possible new approaches to establishing rules of the road in space, particularly in the area of space traffic management. Several non-governmental organizations (NGOs), including the Henry L. Stimson Center, have also laid out recommendations for measures to prevent dangerous military practices in space during peacetime. Indeed, the 2001 Space Commission, initially chaired by current US Defense Secretary Donald Rumsfeld, actually recommended that the United States explore rules of the road concepts for guiding international behaviour in space. Policy makers in space-faring nations should be encouraging these efforts and attempting to find ways to wrap industry concerns, and NGO efforts, into multilateral political and military discussions about ensuring space security. Again, this is an area where US national security interests coincide with those of the larger community of space stakeholders, and an area where there are avenues to promote dialogue.

The key point is that now is the time for launching concerted and constructive dialogue among the space-faring powers, as well as constructive criticism of emergent activities that could threaten the security of global space assets. While the United States may be unwilling to work toward a ban on space weapons, it remains a major—and for the most part responsible—player in space. Isolating the United States because of its position on space weaponization is simply a waste of time; or worse, attempts to do so may well backfire by promoting the views of those in the United States who see unilateral approaches to security as the only approaches. Meanwhile, other space-faring nations need to be discouraged from treading down similarly destructive paths. This brings even more urgency to undertaking initiatives that promote cooperation among the space-faring powers in areas where they have mutual interests. There is little time to waste.

Notes

1 Christopher M. Petras, 2003, The Debate over the Weaponization of Space: A Military-Legal Conspectus, *Annals of Air and Space Law,* Montreal, Canada, Institute and Centre of Air and Space Law, McGill University.

2 United Nations Information Service, *Outer Space Legal Subcommittee Concludes Fourth-Second Session in Vienna*, UNIS/OS/258, Press Release, 7 April 2003, at <www.unis.unvienna.org/unis/pressrels/2003/os258.html?print>.

3 United States Mission to the United Nations, Statement by Kenneth Hodgkins, United States Adviser to the Fifty-seventh Session of the United Nations General Assembly, on Agenda Item 75: International Cooperation in the Peaceful Uses of Outer Space, in the Fourth Committee, 9 October 2002, Press Release #147, 2 October 2002, at <www.un.int/usa/02_147.htm>.

CHAPTER 12

PREVENTING THE WEAPONIZATION OF SPACE: US GRAND STRATEGY AND THE DOMINATION OF SPACE

Wade L. Huntley

INTRODUCTION

Regarding space security, I will address "the road ahead". In my view, the road ahead is steep. The way is strewn with obstacles. The weather is bad. Others in the "Safeguarding Space Security: Prevention of an Arms Race in Outer Space" conference have said that preventing the weaponization of space is a matter of years, not months. But on such an arduous road, we will need every day of those years.

The task is especially daunting given the head start the United States has in the opposite direction—not just technologically, but in ways of thinking. My remarks will address two points in this regard:

1. I will review US military planning, already well underway in the 1990s, for space dominance as an aspect of military dominance.
2. I will consider how the Bush Administration, while not initiating such planning, has expanded it and built upon it.

From this, I conclude that, while this strategy may be unrealistic, the issues at hand are not solely about realistic responses to foreseeable threats. Practical efforts to preserve space security are necessary but insufficient for preventing the weaponization of space. The underlying visions driving ambitions for space weaponization must also be addressed.

DOMINANCE: UNITED STATES AIR FORCE (USAF) AND UNITED STATES SPACE COMMAND (USSC) VISIONS

The USAF and USSC visions for the "dominance" of military uses of outer space precede the advent of the Bush Administration. Moreover, these military agencies have been quite public in articulating these visions.

Consider the USSC widely circulated document *Vision for 2020*, released in 1998, which portrays the militarization of space as resulting from "natural historical progression". According to this vision, just as air power developed to support land and sea military operations, so is "space power" now set to "evolve into a separate and equal medium of warfare".[1]

The USSC *Vision for 2020* was followed in early 2001 by the more infamous and inflammatory report of the Donald Rumsfeld-chaired Space Commission. Warning of an impending "Space Pearl Harbor", the commissioners' conclusion is clear:

> The Commissioners believe the US Government should vigorously pursue the capabilities called for in the National Space Policy *to ensure that the President will have the option to deploy weapons in space* to deter threats to and, if necessary, defend against attacks on U.S. interests.[2]

These documents are not emerging from a vacuum. The planning they depict is embedded in a far-reaching effort dating from the end of the Cold War to anticipate and plan for the kinds of military engagements that the US military may face in the coming decades.

This effort is epitomized by the *Air Force 2025* study, a wide-ranging and copious effort "to look 30 years into the future to identify the concepts, capabilities and technologies the United States will require to remain the dominant air and space force in the 21st century". The study, concluded in 1996 and consisting of a collection of works totalling more than 3,300 pages of text, evaluated 25 emerging technologies and 40 separate systems through the lens of six "alternative futures".[3]

Several of the priorities and technologies most highly valued in this comprehensive study are familiar from the later summary documents noted above. One noteworthy aspect of this study is the recurring conviction that

an information/space arms race is already underway, with the inevitable erosion of the current US lead driving future military needs. Thus, the study concludes, "By 2025 it is very likely that space will be to the air as air is to cavalry today".

A second prominent aspect of the study is the unquestioned premise that US retention of aerospace dominance is the principal objective. One weapon system singled out in the study is the Global Area Strike System; a key element of this system would be a *ground-based* high-energy laser capability:

> … a continental US-based laser system which bounces high energy beams off a constellation of space-based mirrors. Inherently precise, megawatt-class, light speed weapons can potentially act within seconds or minutes to impact on events in space, the atmosphere, or the earth's surface. … *Although it can strike from space, no actual weapons are based in space*.[4]

The argument that a high-powered directed-energy system depending on precision mirroring satellites does not constitute weapons "based in space" conflicts with the definition utilized by Foreign Affairs Canada's Space Security Index, which inclusively designates as space weapons "objects passing through space, via the projection of mass or energy".

This assertion begs the question discussed at this conference, namely: What is weaponization? The potential for conflict and ambiguity in answering such a question raises further concerns about the achievability and feasibility of any international agreement that would seek to draw that line in the face of emerging new technologies.

Note that this planning by the USAF is itself embedded in trans-service long-term planning represented by the *Joint Vision* publications. *Joint Vision 2020*, the most recent articulation issued in 2000, retains the central US military planning objective of "full-spectrum dominance".[5]

In the minds of US military planners, this imperative was given greater urgency by Saddam Hussein's attempt to jam US global positioning system satellite signals at the outset of the US invasion of Iraq in March 2003. In the words of General Lance Lord, USSC commander, "The war in space began during Operation Iraqi Freedom".[6]

All of the planning reviewed above preceded the election of the Bush Administration. Does this indicate that this administration's new strategic initiatives, including space weaponization, are merely taking the wrap for Pentagon planning that was well developed in the preceding decade? The answer is, in part, yes, but in part, no, for the Bush Administration has added crucial elements of its own.

FROM DOMINANCE TO DOMINATION: THE BUSH ADMINISTRATION

The Bush Administration did not initiate planning for US military dominance of space, but it has significantly advanced that planning in three ways by:

- elevating the ambitions to the level of national policy;
- moving forward aggressively with research and development of the identified key technologies; and
- building a strategic rationale for military dominance.

As the first two of these elements are more familiar, I would like to focus on the last.

The distinction between dominance and domination is not merely rhetorical. "Dominance" as articulated in the Bush Administration's strategic pronouncements represents abandonment of the justification that military planning and capabilities acquisition responds to current or foreseeable threats at all.

The Bush Administration implemented this transition in strategic thinking in the 2001 *Quadrennial Defense Review* and the 2002 *Nuclear Posture Review*, which introduced the qualitative conceptual shift from a "threat-based" to a "capabilities-based" approach to strategic planning.[7]

The open embrace of military development beyond that needed to meet current or foreseeable threats pervades the Bush Administration's strategic policy documents. A similar shift is now taking place throughout Pentagon planning. This shift is not merely a means to justify dramatic US re-armament willy-nilly; nor is it simply a surrender to the US military–industrial interests. Rather, "capabilities-based" planning also enables the

more proactive, idealistically-driven international agenda that has become central to the administration's world view.

The Bush Administration's National Security Strategy (NSS) articulates these ambitions, determining to maintain unequalled US power and influence indefinitely in order to promote governmental transitions favourable to US interests throughout the world. In the language of the NSS, US power will be deployed to "create a balance of power that favours human freedom" and "extend the peace by encouraging free and open societies on every continent".[8]

This vision harkens to a nineteenth century conception of US international activism underpinned by the security of broad oceans. The Bush Administration strategic posture, at its core, seeks to take advantage of the emergence of the United States as the world's pre-eminent military power to restore a nineteenth century vision to constitute a safer world through virtuous exercise of American power.

This vision represents the ascendance of idealists over realists in shaping US grand strategy. However, within the idealist tradition this particular vision also represents a triumph for *unilateral militant idealism* over *multilateral liberal idealism*. Although John Lewis Gaddis depicts the Bush NSS as rekindling Woodrow Wilson's mission to make the world "safe for democracy", the vision resonates more the "big stick" idealism of Theodore Roosevelt.

Thus, the Bush Administration has taken the impulse to dominance emanating from US military thinking in the 1990s one giant step further, by fitting it as the engine to power a militarily-active but ideationally-driven US global role.

CONCLUSION

This vision, always part myth, is more illusory today than ever before. Military power alone is no protection from the asymmetric threats emanating from globalization's seamy side.

More fundamentally, pursuit of this vision ignores the central lessons of "realpolitik". Military build-ups that go beyond meeting clear and present

dangers are inevitably considered as signals of more aggressive intentions—this is basic international realism.

The Bush Administration's grand strategy to remake the world on the basis of US unassailability must ultimately prove quixotic. Down this road, tragically, also lies eroding international security and human security, worldwide.

The weaponization of space is the "cutting edge" of this process. Blunting that edge requires not merely confronting that prospect critically, but also engaging the underlying vision constructively and positively by offering a better, more viable and more imaginative vision in its place.

This road is difficult. However, success holds the promise not only to sustain the sanctuary of space, but also to resume progress toward disarmament and peace here on Earth.

Notes

1 United States Space Command, 1998, *Vision for 2020*, p. 4, at <www.fas.org/spp/military/docops/usspac/visbook.pdf>.

2 United States, 2001, *Report of the Commission to Assess United States National Security Space Management and Organization*, Washington, DC, Government Printing Office, p. 12 (emphasis added), at <www.defenselink.mil/pubs/space20010111.html>.

3 United States Air Force, 1996, *Air Force 2025 (Executive Summary)*, Maxwell Air Force Base, AL, Air University Press, chapters 2, 3, 6, at <www.au.af.mil/au/2025/index2.htm>; also see *A Quick Look at Air Force 2025* at <www.au.af.mil/au/2025/quicklk2.htm>. This information is also available at <www.fas.org/spp/military/docops/usaf/2025/index.html>.

4 United States Air Force, 1996, chapter 8 (emphasis added), ibid.

5 Jim Garamone, 2000, *Joint Vision 2020 Emphasizes Full-spectrum Dominance*, Washington, DC, American Forces Press Service, at <www.defenselink.mil/news/Jun2000/n06022000_20006025.html>.

6 General Lance Lord, 2005, speech on 14 December 2004 as quoted in Mike Moore, "Space War—Now We're Jammin'!, *Bulletin of the Atomic Scientists*, vol. 61, no. 2 (March/April), pp. 6–8.

[7] The *Quadrennial Defense Review* is available at <www.defenselink.mil/pubs/qdr2001.pdf>. The *Nuclear Posture Review* was first publicly summarized at a Department of Defense briefing on 9 January 2002. The classified review was subsequently obtained by the *Los Angeles Times* and *The New York Times*. Substantial excerpts of the *Nuclear Posture Review* are available at <www.globalsecurity.org/wmd/library/policy/dod/npr.htm>.

[8] United States, 2002, *The National Security Strategy of the United States of America*, Washington, DC, the White House, p. 1.

CHAPTER 13

AN EFFECTIVE WAY TO PRESERVE THE SECURITY AND PREVENT AN ARMS RACE IN OUTER SPACE TO NEGOTIATE AND CONCLUDE AN INTERNATIONAL LEGAL INSTRUMENT AT AN EARLY DATE

Wu Haitao

It is a great honour for me to participate in this conference. Many speakers have shared their incisive views on different aspects of maintaining the security and preventing an arms race in outer space; I am going to share with you some of my thoughts on the road ahead about preventing an arms race in outer space.

The development of science and technology in the peaceful uses of outer space have brought unprecedented benefits to our economy, culture and many other areas of human life. History tells us that the development of science and technology could spearhead weapons development and thus bring havoc to human beings. Regrettably, there are signs that such a scenario is turning into reality in outer space.

To guard against this emerging danger of the weaponization of and an arms race in outer space, logically, we have but three roads to choose from.

The first road is to not place any restrictions, and let outer space remain open to all. The second is to impose limited restrictions by relying on international pressure and national political willingness. The third is to impose strict legal measures to nip the danger in the bud.

The first road will lead us nowhere. If there are no restrictions on the weaponization of and an arms race in outer space, in the near future various kinds of space weapons would fill outer space and the fruitful achievements on the peaceful uses of outer space would be in jeopardy. Outer space would eventually follow the land, sea and sky to become the fourth

battlefield. To prevent this, we have to spare more efforts to deal with such issues as “non-proliferation of weapons in outer space” and “weapons reduction in outer space”.

The second road would provide a limited effect at best. The international community could, through various political efforts, formulate sufficient international pressure to oppose the weaponization of and an arms race in outer space. However, good political will alone is inadequate to hold back the pace of the weaponization of outer space. If there are no legally binding instruments to restrict the development and deployment of outer space weapons, countries are more likely to protect their outer space properties by military means rather than depend on the good will of other countries.

The third road is the most promising. Over the years, the international community has concluded a number of legal instruments regulating the protection of space vehicles, international liability for damage caused by space objects, confidence-building measures, prohibition of the placement of nuclear weapons or other weapons of mass destruction (WMD) into orbit around the Earth or on celestial bodies, prohibition of the militarization of the Moon and prohibition of the development, testing and deployment of missile defence systems and their components in outer space. All of these instruments have played a positive role in promoting the peaceful exploitation and uses of outer space.

However, the scope of these instruments is very limited. For example, the Outer Space Treaty only prohibits the deployment of nuclear weapons and other WMD in outer space, leaving other types of advanced conventional or “new concept” destructive weapons unchecked. The Anti-Ballistic Missile Treaty has been abrogated and thus impaired the international laws on the restriction of development and deployment of space weapons. Many are of limited adherence, such as the 1979 Moon Agreement. In addition, these instruments do not deal with such issues such as the threat or use of force from the Earth (whether from land, sea or air) against space objects.

Therefore, mending current international legal systems on outer space and stipulating a comprehensive international legal instrument on the prevention of the weaponization of and an arms race in outer space should be high on our agenda.

We have a good intellectual foundation for this effort:

- Australia, Canada, China, Egypt, France, Germany, Italy, the Russian Federation, Sri Lanka, Sweden and Venezuela, to name just a few countries, have forwarded many constructive suggestions and proposals to the United Nations and the Conference on Disarmament (CD).
- In June 2002, China and the Russian Federation along with several other states submitted to the CD the working paper Possible Elements for a Future International Agreement on the Prevention of the Development of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects (CD/1679), which set out a preliminary conceptual framework for a future space legal instrument; through the continued joint efforts of these states the framework is becoming more substantial and precise.
- The Henry L. Stimson Center in the United States proposed the *Model Code of Conduct for the Prevention of Incidents and Dangerous Military Practices in Outer Space*; and several countries proposed efforts for the security and protection outer space assets, confidence building and enhancing measures, space debris management, and developing rules of road in outer space—all of which deserve serious consideration by all sides.

We also have a competent negotiating body. As the sole United Nations-authorized negotiation mechanism for arms control and disarmament treaties, the CD is well suited to negotiate and conclude a legal instrument on the prevention of an arms race in outer space. We should take full advantage of current conditions by quickly establishing an ad hoc committee and starting to negotiate relevant international legal instruments. This is the most promising road ahead in order to prevent the weaponization of and an arms race in outer space. We hope that all states, for the long-term security interests of all human beings, will support the programme of work of the CD.

In addition, we should take full advantage of the United Nations Committee on the Peaceful Uses of Outer Space to establish principles and regulations, promote international cooperation and explore and study scientific and legal issues concerning the peaceful uses of outer space.

The peaceful uses of outer space and prevention of an arms race in outer space are mutually complementary. If we make full use of existing

mechanisms and put in place an international legal system preventing the weaponization and an arms race in outer space, then peace and security in outer space truly will be preserved.

ACRONYMS

ABM	Anti-ballistic missile
ASAT	Anti-satellite
BMD	Ballistic Missile Defense
CD	Conference on Disarmament
COPUOS	Committee on the Peaceful Uses of Outer Space
CSO	Common Security in Outer Space
ESA	European Space Agency
ICOC	International Code of Conduct against Ballistic Missile Proliferation
ITU	International Telecommunication Union
JDEC	Joint Data Exchange Center
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organisation
NGO	Non-governmental organization
NMD	National Missile Defense
NORAD	North American Aerospace Defense Command
NPT	Nuclear Non-Proliferation Treaty
NSS	National Security Strategy
OODA	Observation, orientation, decision and action
OST	Outer Space Treaty
PAROS	Prevention of an Arms Race in Outer Space
RAMOS	Russian-American Observation Satellite
SDI	Strategic Defense Initiative
START	Strategic Arms Reduction Treaty
WMD	Weapons of mass destruction
UNIDIR	United Nations Institute for Disarmament Research
UN	United Nations
US	United States
USAF	United States Air Force
USSC	United States Space Command