CONFERENCE ON DISARMAMENT

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LETTER DATED 4 SEPTEMBER 2009 FROM THE PERMANENT REPRESENTATIVE OF CANADA TO THE CONFERENCE ON DISARMAMENT ADDRESSED TO THE SECRETARY-GENERAL OF THE CONFERENCE TRANSMITTING THE REPORT OF THE CONFERENCE ORGANIZED BY UNIDIR ENTITLED "SPACE SECURITY 2009: MOVING TOWARDS A SAFER SPACE ENVIRONMENT" HELD FROM 15 TO 16 JUNE 2009 IN GENEVA

The Permanent Mission of Canada to the United Nations presents its compliments to the Conference on Disarmament, and has the honour to forward to you a copy of the summary report on the conference "Space Security 2009: Moving towards a Safer Space Environment" on behalf of the United Nations Institute for Disarmament Research (UNIDIR).

We would be grateful if this report could be issued as an official document of the Conference on Disarmament and distributed to all Member States to the Conference as well as to Observer States participating in the Conference.

(Signed): Marius Grinius
Ambassador
Permanent Representative
to the Conference on Disarmament

Space Security 2009: Moving towards a Safer Space Environment
15–16 June 2009, Palais des Nations, Geneva

Conference Report

1. The conference "Space Security 2009: Moving towards a Safer Space Environment" was the latest in a series of annual conferences held by the United Nations Institute for Disarmament Research (UNIDIR) on the issue of space security, the peaceful uses of outer space, and the prevention of an arms race in outer space (PAROS).

2. The purpose of this conference series is in line with UNIDIR's mandate: to promote informed participation by all states in disarmament efforts and to assist delegations to the UN Conference on Disarmament (CD) to prepare for possible substantive discussions on PAROS. Since the series was launched in 2002, these conferences have received the financial and material support of a number of Member States, foundations and non-governmental organizations, showing the broad political support for these discussions.

3. This year's conference focused on five primary topics:

(a) architectures for improving space security;

(b) ensuring space sustainability: confidence- and security-building measures;

(c) elements of treaty-based security;

(d) international law and space security; and

(e) emerging issues for space sustainability.

4. Events of the preceding 18 months contributed greatly to building interest in the 2009 space conference. In February 2008, The Governments of the People's Republic of China and the Russian Federation tabled in the CD a draft treaty on preventing the placement of weapons in space. The draft Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects (PPWT) was the result of many years of consultations, and aims to contribute to the CD's work on PAROS. In February 2009, the question of space security was again in the public eye with the collision of Iridium 33, an operational US communications satellite, and Cosmos 2251, a decommissioned Russian communications satellite, in low Earth orbit over northern Siberia. The collision was the first to involve two intact satellites, and resulted in more than 700 new pieces of orbital debris. Finally, on 29 May 2009, after more than a decade of deadlock, the CD adopted a programme of work that includes a formal working group to discuss substantively, without limitation, all issues related to the prevention of an arms race in outer space.

5. The conference was convened in Geneva, Switzerland, at the Palais des Nations on 15–16 June 2009. The meeting was organized by UNIDIR, with financial and material support from the Governments of Canada, the People's Republic of China and the Russian Federation, as well as from the Secure World Foundation and The Simons Foundation. Representatives from UN

Member States, UN Observers, non-governmental organizations and civil society from all over the world brought the total number of participants to over 75. The speakers represented nine countries: Canada, Colombia, China, France, Japan, the Netherlands, Russia, Switzerland and the United States.

6. The following is a report of the conference. The keynote speakers and panellists are identified along with summaries of their presentations. The Chatham House Rule applied in the ensuing discussions.

Keynote 1

"The Threats to Space: An Overview"

Sergei Ordzhonikidze, Director-General of the United Nations Office in Geneva

7. The conference was opened by a keynote speech from Sergei Ordzhonikidze. He noted that the conference this year is starting off with a more promising tone, following the breakthrough in the CD, which could not come at a better time. The improvement in technology has allowed for the number of players in space to jump impressively in a relatively short time. Space is being used not only for pure scientific research, but also for communications, natural disaster mitigation, environmental monitoring, telemedicine, tele-education and more. Considering the world's dependence on space for development, nations must work together to protect this natural resource. To that end, preventing the weaponization of outer space is fundamental to collective security. This is why open discussions and improvements upon the space treaties from the 1960s and early 1970s are imperative. Mr. Ordzhonikidze stated that all areas of disarmament are connected. A continued sense of urgency and political will are necessary as the world works together for greater global security. He closed with the warning: the longer the international community waits before taking action, the more difficult it will be to achieve effective arms control in outer space. This is true for all disarmament issues, but it is true especially in space, where technology is advancing so quickly.

Session 1

Architectures for Improving Space Security

8. Zhang Ze from the Arms Control Department of the Ministry of Foreign Affairs of the People's Republic of China began the session by presenting an overview of the ideas behind PAROS. Mr. Zhang stated that foundations must be built for a safer global environment and space is an integral part of this. It is estimated that more than 1,100 satellites will be launched between 2009 and 2018. Many of these will add to global well-being, and for that reason he supports a plan for "Zero Weapons Outer Space." The Zero Weapons Outer Space plan includes no weapons based in space, no use of force against systems in space, and no threat of use of force against outer space objects including hostile testing or actions that threaten space-based assets. The main threats from space weaponization are an arms race and the high potential for increased space debris. Mr. Zhang echoed the warning of Mr. Ordzhonikidze: once an arms race in space is full-fledged, it will be very difficult to turn it around. While political will is important, a legal framework is necessary. Many papers have been submitted in the past couple

of years regarding the prevention of the weaponization of space. In particular, Mr. Zhang cited the Sino-Russian PPWT. The current space treaties and legal instruments have loopholes and, Zhang argued, it is time to open up serious discussion on the legal framework. China, he stated, is ready for bilateral and multilateral talks. He concluded by expressing that if the international community does not act now, the world may miss an important window for success.

9. Phillip Baines, the Deputy Director of the Non-Proliferation and Disarmament Division of Foreign Affairs and International Trade Canada, discussed confidence- and security-building measures for space security. He first laid out the security challenges in terms of actions that cause irreversible and reversible harm. The threats that would create irreversible harm come from Earth-based and space-based weapons that are specially designed to damage or destroy. Further, there are threats from certain dual-use (military–civil) satellites that could also damage or destroy. Finally, there is also the threat from collisions in space or debris striking the surface of the Earth. The primary concern regarding this type of threat is the creation of space debris. In large quantities, debris could render space unusable for centuries or millennia. The threats to space security that could result in reversible harm are largely electronic, rather than direct physical threats. Examples are purposeful interference or inadvertent interference such as competing radio or electro-optical frequencies. Because states can generate space debris much faster than the natural space environment can cleanse itself, Baines argued strongly that states must not fight war in space with weapons that cause debris. If states decide to use radio or electro-optical tactics against satellites in times of war, those actions should be undertaken in conformance with international law, and should have only temporary and localized effects. Moreover, such purposeful interference should not originate from any satellite itself, except in the case of self-defence.

10. Mr. Baines presented three rules for preventing a scenario where space is rendered unusable:

(a) ban the placement of weapons in space;

(b) prohibit the testing or use of weapons on satellites so as to damage or destroy them; and

(c) prohibit the testing or use of satellites as weapons themselves.

11. He proposed that these rules become the basis for a Space Security Treaty with an executive committee and a chairperson who reports to the UN Security Council. Compliance would be based on information collected by national or multinational technical means of observation. Mr. Baines also recommended creating Regional Space Operation Centres that would use improved space situational awareness systems to provide these monitoring services for compliance purposes.

12. The president of the French Air and Space Academy, Gérard Brachet, closed the panel by bringing to light two primary issues addressed by the conference: space debris and space situational awareness. At the moment, there are over 50 states operating in space and over 880 operational satellites, he said. Because of the increased demand of space in low Earth orbit (LEO) and geostationary Earth orbit (GEO), orbital and spectral resources must be better

managed if those resources are going to remain useable. Specifically, Brachet said, international mechanisms for space management are now required. If the international community does not put these mechanisms in place, more incidents such as the satellite collision of February 2009 will occur. As an example of a model that has helped make progress towards sustainable space operations, Mr. Brachet pointed to the Inter-Agency Space Debris Coordination Committee (IADC). According to the IADC, its purpose is to "exchange information on space debris research activities between member space agencies, to facilitate opportunities for cooperation in space debris research, to review the progress of ongoing cooperative activities, and to identify debris mitigation options". In addition to the IADC's work, member states of the UN Committee on the Peaceful Uses of Outer Space (COPUOS) in Vienna approved the topic of "Long-Term Sustainability of Outer Space Activities" as a new agenda item in 2010 that will also be incorporated into a multi-year work plan. Mr. Brachet concluded that ensuring the long-term, safe and sustainable use of outer space is an issue that concerns all national and commercial operators. The February 2009 collision is clear evidence that the issue is not just academic theory but, in fact, a reality that must be addressed collectively.

13. Following the panel the floor was opened to discussion. One question was raised regarding the development of the international policies and instruments: would larger space-faring nations be willing to take small steps to reach the greater international goal of sustainable space? Importantly, there was agreement that these countries are willing to take the steps. Both small and large countries recognize the need for space security and that the development of international instruments will be required to ensure that security—highlighting the critical nature of the CD's planned work under Agenda Item 3 on PAROS.

14. A second question was raised regarding the type of weapons that could be used to disable satellites in a reversible manner. The potential for use of interfering or blocking signals against satellite broadcasts was discussed during the panel, and brought to light the idea of sending false signals to satellites. These signals would confuse the satellites by sending wrong or misleading instructions. While no conclusion was reached on how international policies should deal with such actions, there was the suggestion that satellite operators and developers should do their best to ensure high levels of data encryption for control of satellites.

15. Another question raised during the discussion was whether the European Code of Conduct and the PPWT could complement each other or whether a decision to pursue one instead of the other should be made. The conclusion was that they could coexist. Further, regardless of what political instrument or collection of political instruments is chosen to regulate space activities, the scientific and technical aspects must guide the instruments' development.

Keynote 2

"Towards a Norm of No Harmful Interference"

Hamadoun Touré, Secretary-General, International Telecommunication Union

16. In the second keynote speech, Hamadoun Touré presented the conference with an overview of the International Telecommunication Union (ITU). The first telecommunications satellite was launched in the 1960s, and the use of space has progressed very quickly since then.

Today, satellites are used for everything from transmitting televised world sports events and mobile telephone calls to tracking crucial environmental and weather patterns. The ITU consists of more than 700 members from both public and private organizations. Mr. Touré's organization is in charge of coordinating the more than 250 commercial and governmental (including military) satellite systems that are currently active. One of the ITU's primary roles is that of managing access to orbital slots. Not so long ago, 6˚ of separation between satellites was considered crowded. Today, in some of the most desired orbital slots, the separation has been reduced to 0.5˚ by the use of advanced technologies for ensuring against signal interference. This coordination of the ITU orbital slot register often takes pain-staking negotiations, but the process—which is voluntary—is internationally accepted. Considering millions of dollars are at stake with each of these satellites, all parties cooperate regardless of ideological differences. With the ITU's purpose and the conference's main goal of discussing the sustainable use of space in mind, Mr. Touré reemphasized the ITU's resolve to work closely with UNIDIR.

Session 2

Towards a Norm of No Harmful Interference

17. The second panel began with remarks from Richard DalBello, Vice President of Government Relations at Intelsat General Corporation. Mr. DalBello examined how the commercial arena is reacting to the increased demand for orbital slots, and growing concerns about the potential for interference and collisions. All members of the international community that are operating satellites need to know about the "conditions of the road" in space. Intelsat relies on an in-house system to track all of the operational details of its satellites. The company also relies on orbital positioning data from the US Air Force's Joint Space Operations Center space object catalogue and tracking system for objects in orbit. In particular, Intelsat is in close communications with the Joint Space Operations Center when Intelsat is about to move its satellites to ensure a safe orbital transfer. The primary issue with current space object databases is that they are not accurate enough for long-term planning. This requires Intelsat and other satellite operators to plan buffer zones and engage in avoidance manoeuvres of their satellites, which reduces their lifespan. Another important problem with the databases is the lack of data reporting standards. In response, commercial satellite companies are developing a prototype database using self-generated positioning data. This database would use common language, measurements and models for estimating satellite position. It would also include direct contact information for satellite operators, which today is not readily available. The database could perhaps be a starting point for a common tool that would one day incorporate government data.

18. In addition to the increase in demand for orbital slots, there is also a growing problem with the demand for satellite terminals. Mr. DalBello noted radio frequency interference has become such an issue that the Satellite Operators Radio Frequency Interference action group was started. So far, the group has determined that a combination of decreased slots, increased demand, and operator error have been the primary causes behind most episodes of interference. The satellite operators have started working on technology that would transmit identifying information for each terminal in order to be able to mitigate unintentional interference, and are increasing operator training.

19. Mr. DalBello concluded by saying that the challenges facing satellite operators (not just commercial operators) will only increase in the next decade. The first place to start in addressing these challenges is a common data-sharing tool. Beyond that, there is much work that needs to be done, both technologically and politically. Mr. DalBello emphasized that the commercial sector is more than willing to do its share.

20. The second speaker on the panel was Bruce MacDonald, Senior Director on the US Congressional Commission on the Strategic Posture of the United States. His talk took a broader view of space stability, as seen from a primarily US political perspective. By 2035, there will be 10 times the amount of space debris orbiting the Earth. To ensure the benefits of the use of space in future decades, space stability is imperative. No stranger to this fact, the United States is increasingly willing to negotiate. The goal of these negotiations should be a stable and secure space regime. To achieve this goal, the international community will need clarity to build confidence and flexibility in negotiations. The international community members—civil, commercial and military—all stand to gain from these discussions. Mr. MacDonald also pointed out that key to these discussions will be military-to-military exchanges, of which there have not been enough so far.

21. To start these talks, Mr. MacDonald proposed starting small with a kinetic energy anti-satellite weapon (KE-ASAT) test ban. KE-ASATs could produce massive amounts of space debris and subsequent cascading effects that would significantly raise the risks to satellites. To prevent this, he suggested prohibiting tests or actual launches of KE-ASATs that intercept orbiting assets. While he conceded that this only covers one of the many issues facing the future of space use, he was clear that it would be a good start that could be completed relatively quickly, as opposed to a general treaty to ban anti-satellite weapons and space-based weapons. Mr. MacDonald concluded by reminding the conference attendees that they should not "let the best become the enemy of the good".

22. The final speaker of the panel was Andrey Grebenshchikov, the Third Secretary of the Department for Security and Disarmament Affairs in the Russian Ministry of Foreign Affairs. Mr. Grebenshchikov presented a report prepared by a group of Russian government experts—Mr. Alexander Klapovsky from the Ministry of Foreign Affairs, Mr. Vladimir Putkov from the Russian Space Agency, Mr. Sergey Ionov from the Ministry of Defence, and himself—reviewing the collision incident of 10 February 2009 between the Russian satellite, Cosmos 2251, and the US satellite, Iridium 33. This collision shines light on the issue of space debris and the need for space object data exchange. Even though the US satellite had the capability to manoeuvre to avoid the situation, the collision nevertheless occurred. Here, the key problem was the lack of proper information collection and dissemination. Because of this incident and the predictions of the trends in space debris, Russia is proposing that a better system for data exchange be developed and, therefore, has decided to submit to the United Nations Secretary-General its revised proposals on international outer space transparency and confidence-building measures in the implementation of UN General Assembly resolution 63/68.

23. The discussion that ensued focused primarily on the development of the proposed space object database and ITU coordination and collaboration. In the discussions about space object databases, it was proposed that, in the future, space activities will become transparent and the idea of "hiding" objects in space will be irrelevant. The question is one of starting this database,

which is dependent on the good will of the key players involved. Once the key players engage, momentum is expected to rapidly increase—more information from the key players will be donated to the database and more new players will become involved.

24. The second part of the discussion focused on how the ITU coordinates orbital slots. How does the ITU work in an environment where the orbital and frequency slots are limited resources that are in increasing demand? The ITU approaches the problem of limited resources in two ways: it tries to find fair ways of allocating the resources, and it tries to examine ways to increase availability of the resources. The primary way that the ITU deals with allocation issues is through consensus, which works because ITU members approach problems largely from a technical and quantitative aspect. Voting always results in perceived winners and losers, which can poison the atmosphere among members. At the same time, the ITU tries to increase availability of resources by researching new spectra. These research projects tend to be in coordination with government and commercial partners.
This discussion of ITU coordination with outside organizations transitioned into how the ITU could work with COPUOS. The conclusion was that the partnership would have to start in GEO matters. Collaboration in LEO matters would be difficult because of high orbital speeds, the fact that satellites are replaced frequently, and because the parameters of satellite constellations are constantly changing.

Session 3

Elements of Treaty-Based Security

25. The third panel began with Vladimir Agapov, Senior Scientist-Researcher at the Keldysh Institute of Applied Mathematics. Mr. Agapov focused on the issue of space situational awareness (SSA) and the need for building an international monitoring tool to support a space security treaty. To properly support any treaty, data on the orbital debris population must be effectively collected, processed and shared. The tool must incorporate several elements:

(a) the data must be internationally verified;

(b) the data must be constantly updated with object trajectories;

(c) there must be common criteria identifying and tracking objects;

(d) monitored objects must be associated with a country and organization of ownership for responsibility assessment;

(e) the system must be able to recognize treaty non-compliance and potential close encounters based on trajectories; and

(f) the system must be able to collect and analyze closely information from all collisions or other incidents.

26. Once this information is collected and analyzed the question becomes how to share it. The rules for distribution must define which data are required to be shared, what is the required

timeline for sharing data, what is the standard data representation format, and who has access to the data. The primary and most complicated challenge with the dissemination will be countries' national security concerns.

27. Mr. Agapov proposed the development of a network of internationally shared tracking sensors. This would spread out the costs of the system and achieve the necessary geographical distribution of sensors. As an example of a base system of debris tracking, he described the International Scientific Optics Network (ISON), coordinated by the Keldysh Institute of Applied Mathematics. ISON is made up of 18 institutions in nine countries with 18 observatories operating 25 optical instruments. ISON focuses on GEO and highly elliptical orbits (HEO) and, since 2003, ISON has made more than 950,000 measurements. Between 2005 and 2008, the population of known and tracked objects in GEO has been increased more than 35 per cent. Mr. Agapov asserted that ISON data are more complete and precise than the data made available by the United States—which is the only nation that publicly shares its orbital positioning data. The success of the ISON project has proven the feasibility of creating an international observation network and data centre.

28. Jeffrey Lewis, Director of the Nuclear Strategy and Nonproliferation Initiative at the New America Foundation, followed up with a discussion of the challenges to establishing treaty verification measures. The most important aspect of promoting stability in space is preventing an arms race. To prevent an arms race, verification is essential, particularly as nations currently interact with mutual suspicion in space. An important issue in verification is the fact that many satellites are dual-use—often only a software change makes the difference between a military and commercial satellite. Therefore, possible verification methods could include the sharing of SSA data, improved missile launch warning agreements, a mix of ground- and space-based sensors, protocols for cooperative verification, development of protocols for laser ranging, and a non-interference clause to determine permitted activities to account for dual-use satellites.

29. The final speech on the panel was given by Col. Andrey Makarov, discussing the developments of the Sino-Russian PPWT, tabled in February 2008. While there has been a call for transparency and confidence-building measures, Mr. Makarov stated that such measures are not a replacement for a treaty on disarmament in space. This treaty, he assured, would provide definitions needed for proper regulation. For example, he noted that there is a need to define where space begins; the PPWT suggests space would start at an elevation of 100km above the sea. The basis for this figure is it is about the minimum altitude a satellite needs to orbit. The treaty also defines "weapons" in space. The PPWT states that such would be any device placed in outer space that is produced or converted with certain features to perform certain offensive tasks. Anything else, including a spacecraft that was developed for peaceful purposes, would not be considered a weapon. Russia and China continue to stand behind the PPWT proposal, but also remain open to dialogue and wish to include as many stakeholders as possible in the discussion.

30. Following Mr. Makarov's speech, the floor was open to discussion, which touched primarily on two topics: the extent of verification methods to be included in a treaty and the removal of debris from orbit.

31. A debate on the floor arose regarding how far one should take any verification method. Electromagnetic disturbances, for example, are very hard to verify. Should every space-based

threat be included in a space treaty? Is verifying all testing and actual use worth the result? Some concern was expressed that a treaty draft with too wide a scope—particularly one that encompassed jamming—might prove difficult to ratify or verify. However, there remain disagreements among experts and government officials about what might constitute "too wide" a scope, as well as long-standing differences regarding verifiability of a technology-ban approach. Others expressed the view that a narrow or partial anti-satellite weapon test ban that would ban the testing of a device needed to defeat certain space-based weapons would decrease space security, if were it to proceed before a ban on all space-based weapons. It was largely agreed that the focus should be on the space security threats that have the greatest implications (for example, verification of both actual space weapon use *and* testing).

32. The discussion moved then to a previously unaddressed aspect of the space debris issue: not just developing debris prevention methods through treaties, but ameliorating the current problem. What can be done in the near future to remove debris and how does this play into any treaty process? Models have shown that by 2050 the rate of debris production in LEO will exceed the natural decay of such debris, resulting in yet more rapid increase. The question becomes how to focus resources—what debris should be targeted for removal and in what order? Even if one large piece of debris is removed from orbit every 10 years, it would still not be fast enough to prevent serious problems. The engineering discussion should be started immediately, because implementation is very far away. Regardless of what debris mitigation solution is used, the bottom line is that the international community will need to develop a model of the space debris environment upon which to base proposed solutions that is as close to reality as possible. The optimal version of this model would require data from an international undertaking for which political and legal bases must be established.

Keynote 3

"The Importance of Space Security for Emerging Space States"

Ambassador Ciro Arévalo-Yepes, Chair of the United Nations Committee on the Peaceful Uses of Outer Space

33. The final keynote of the conference was given by the chairman of UN COPUOS, Ambassador Ciro Arévalo. Ambassador Arévalo's speech brought to the conference the idea that the use of space for security goes beyond what traditionally may be thought of as physical or military security. He explained that space must be protected to allow its use in ensuring human security as humanity evolves. This is among the main aims of the committee he chairs—COPUOS has helped to develop and guide the legal and cooperative processes that underpin space activities for sustainable human development.

34. As an example, at this year's COPUOS meeting, the tenth anniversary of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) was celebrated. Many of the recommendations from UNISPACE III focused on global sustainable development. COPUOS and its two subcommittees (the Legal Subcommittee and the Scientific and Technical Subcommittee) have worked hard over the past 10 years, implementing 30 of the 33 recommendations set forth by UNISPACE III. As a second example of COPUOS' work towards global sustainable development, COPUOS has aligned many of its activities to help

meet the Millennium Development Goals. A third example is the work carried out by the Working Group on Space Debris within the Scientific and Technical Subcommittee, which resulted in the adoption by COPUOS of the Space Debris Mitigation Guidelines in 2007. These were subsequently endorsed by the General Assembly with resolution 62/217 in December 2007.

35. The question of how to continue to use space tools to face global development needs must be answered internationally. According to Ambassador Arévalo, efforts must take place on national, regional, inter-regional and global levels. An important aspect of this effort will be necessary collaboration between developed and developing countries. Ambassador Arévalo concluded by saying that 50 years of space history have demonstrated that uses of space and its natural resources serve critical needs and the interests of humankind. He challenged the United Nations to assume leadership and to respond in a fair and responsible manner.

36. Following Ambassador Arévalo's speech, the floor discussion was opened and focused on the mandate of COPUOS to work with other organizations. The conclusion was reached that COPUOS not only could, but must, work with other organizations and bodies dealing with the development and security of space. As the world becomes more interconnected through space, each of the approximately 25 relevant UN organizations will need to become more interconnected. In particular, COPUOS should look to working with the International Atomic Energy Agency (IAEA), the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the CD—as should those organizations seek cooperation amongst themselves as well. The breaking of the stalemate in the CD should serve as a catalyst. All stakeholders should utilize this momentum to begin dialogue amongst themselves. To set an example, as soon as the working group of the COPUOS Scientific and Technical Subcommittee finishes its technical best practice guidelines for the sustainable use of outer space, the results will be shared with UNIDIR.

Session 4

International Law and Space Security

37. The fourth session was opened by a presentation given by Tanja Masson-Zwaan, President of the International Institute of Space Law. Ms. Masson-Zwaan examined the status of current space regulation and then set forth some ideas for the future of space law. Currently, space law is founded on international treaties, customary international law, general principals of international law, and judicial decisions and writings. These sources are supplemented by guidelines, codes of conduct, national legislation, and bilateral and multilateral agreements. She pointed out that one major aspect of space law that needs to be clarified is simply what we mean when we say "outer space". Before going forward, the international community must decide if outer space is defined by the activities that happen there or simply by an altitude measurement.

38. Ms. Masson-Zwaan then gave a background on why space law is needed and its main principles. Among other purposes, space law is developing with hopes to control a potential arms race, to prevent and establish liability on collisions and accidents, to regulate signal interference and space debris, to optimize international collaboration, and to mediate the implications of one day colonizing the Moon. The main principles are that exploration and use of space is open to all and should benefit all states. This implies that there is no sovereignty in space. Further, liability

and responsibility fall to states as they are attached to the activities conducted by their private entities. Finally, space law is broadly guided by the principle of international cooperation and respect for other states, including developing and non-spacefaring countries. Every state is dependent on satellite technology for security, non-military uses and raising standards of living. Therefore, this need to protect the use of space and individual space assets, in fact, is a global issue.

39. Having set the context for modern space law, Ms. Masson-Zwaan then examined various directions it could take. She recommended against attempting to revise the Outer Space Treaty (OST). Potentially, parts of the OST would be nullified if it were reopened and updated. The PPWT, in her view, also is not optimal because it lacks verification methods. Developing a code of conduct also would not be the best solution because, as currently proposed, it would not be as strong as a legally binding treaty. A code of conduct, though, would be a good option where the alternative is nothing. In her view, a new treaty, while difficult to implement, would be best, with the CD and COPOUS developing the guidelines. She concluded by quoting Eilene Galloway, who helped write the congressional legislation in the United States that created NASA, to remind the conference that "Our common goal is to change fear of war into hope for peace".

40. Ben Baseley-Walker of the Secure World Foundation pointed out that following the Second World War there had been a reliance on multilateral treaties, but now there has been a resurgence of interest in bottom-up approaches. The problem lies in trying to create the parallels between space and non-space law with respect to war. Firstly, there is no legal concept of war in space. Secondly, there is no definition of "territory" in space, so when does one know when it has been encroached upon? Further, as pointed out several times earlier in the conference, the question of when and where space law applies has not been definitely answered. Finally, defining proportionality of response to attack is difficult in space, because quantifying the value of space assets is difficult.

41. Because the implications of conflict in space would be so immediate and costly, these space law issues should be examined soon both academically and politically. Moreover, the key component to keep in mind is that space is a truly international arena. As a result, it is important to approach such a question from a multilateral standpoint.

42. The final panellist was Masami Onoda from the Japan Aerospace Exploration Agency. Ms. Onoda's talk examined the parallels between space law and environmental law in hopes of drawing some points of reference for the development of space law. The analysis was in terms of scope, principles and procedures. The most obvious parallels arise from the fact that space and the environment are both international issues that have potential long-term effects reaching both developed and developing countries. Secondly, the same basic principles apply to both environmental and space issues. Conventional customary law asserts that countries may do what they like within their states as long as they do not negatively affect their neighbours. Environmental law adds that states have the duty to prevent and reduce environmental harm as well as contribute to the monitoring of the environment—particularly the air and sea. This idea could also be applied to space. The key is creating a sense of international community in establishing these rules. The procedures behind environmental law are based on verification methods: photography, surveillance and geological monitoring. Monitoring assesses not only the state of the environment but can also inform us of the conduct of nations. This monitoring is key

to universal transparency, a behavioural regulator that has proven to be more effective than coercive sanctions. To conclude, Ms. Onoda stated that the arms control model spilled into environmental law, and now it is time for the environmental model to spill over into space law. The central issue will be to find the best institutional model and the optimal technologies to monitor and manage space security.

43. The questions following panel four were focused on how to develop future space treaties without nullifying the OST, and what such treaties could comprise given the integration of civilian and military equipment on satellites. Concerning the potential invalidation of the OST if it were reopened or if a new treaty were developed, this is a simple principle of law: if a new, updated law is written that goes beyond an existing law, then the existing law is nullified. In the case of the OST, only parts of the treaty might be affected, not the whole treaty. Several participants stressed that the OST must be used as a baseline, and that future work must focus not only on its gaps, but rather how it can be improved.

44. Another question that arose was how space law and politics may change now that military and civilian uses for satellites are merging, and what may happen in the case of an incident. The conclusion was that for the moment there is no problem with the merger—all parties must follow the laws as they are currently set. The issues will arise if weapons are put on satellites that carry civilian equipment as well. This is a question that will have to be addressed in the development of a space security treaty.

Session 5

Emerging Issues for Space Sustainability

45. The fifth session began with a statement from Adigun Ade Abiodun, Head of the African Space Foundation, which was presented by Ray Williamson, Executive Director of the Secure World Foundation. Mr. Abiodun's statement emphasized that space is integral to human security on Earth. Satellites monitor the environment and political situations. Satellites drive telemedicine and tele-education. Satellites support disaster management. Space technology is integral to our daily lives and contributes to sustainable development. It would be a calamity if the use of satellites were lost. Because of this, Mr. Abiodun emphasized that all nations must work diligently and efficiently towards policies that will enable and ensure the continued use of space.

46. The statement from Mr. Abiodun was followed by Richard Buenneke, the Deputy Director of the Office of Missile Defense and Space Policy at the US Department of State. Mr. Buenneke first lauded all of the accomplishments that have come from outer space: telecommunications, global positioning systems (GPS) and weather forecasting, to name a few. As these civil benefits from space continue to develop, so will the interdependencies between government and commercial actors. Commercial satellites, for example, support national security by connecting allied forces, embassies and intelligence agencies. Recognizing the trends, the United States is committed to investing in key space capabilities and relationships with allies and commercial organizations. This effort will include the Departments of Homeland Security, Defense and State and extensive interagency activities. Further, there has been more than five years of close cooperation between government agencies and private sector satellite operators. The US government is working with the private sector to:

(a) adopt an approach to key infrastructure identification and risk assessment processes;

(b) coordinate all users and customers of space infrastructure to plan for risk mitigation; and

(c) integrate commercial satellite communications, remote sensing and other space infrastructure protection plans into national-level plans.

47. Additionally, the United States is working with its allies to support interconnected satellite networks and to exchange infrastructure protection best practices. Moreover, the United States is now making satellite infrastructure protection a specific item on the agenda of its regular bilateral space security dialogues with other nations.

48. Mr. Buenneke pointed out that the United States recognizes the role of diplomacy in working through the increasing complexities of monitoring the use of space. US officials are participating in talks with COPUOS, the International Organization for Standardization and the ITU, as well as with various allies, on new forms of diplomatic and security cooperation. Mr. Buenneke concluded by saying that the security and prosperity of the "global village" is increasingly dependent on space structures and governments cannot succeed by acting in isolation. This means working closely with other governments and non-governmental organizations alike.

49. The final panellist of the fifth session was Yousaf Butt, Staff Scientist at the Harvard-Smithsonian Center for Astrophysics. Mr. Butt's presentation gave a more technical look at one of the emerging issues in space security—laser ranging. This technique uses a laser to bounce light off of an object (a satellite, for example) in order to determine its distance. Mr. Butt reiterated several times the point that one should not attempt to ban all uses of lasers in space. Instead, rules of the road must be established. There are a myriad of peaceful uses of lasers in space: optical communication links, providing power to satellites, active imaging and satellite laser ranging. The permanent threat to satellites is relatively low. If a laser pulse is directed outside of a satellite's "viewing area", then the satellite is generally unharmed. If the laser pulse is directed into a satellite's viewing area, occasionally the satellite can be dazzled, or "blinded". Only when the laser is directly under the satellite is there a risk of permanently harming the satellite. In conclusion, Mr. Butt suggested two possible rules of the road: no lasing of satellites that are directly overhead, and no lasing of satellites that are not meant to be lased.

50. The question and answer session that followed examined further the use of lasers and the US focus on working bilaterally with allies (rather than in a larger multilateral context) to develop a robust space protection system. In the discussion on the use of lasers, questions arose of whether there should be a power threshold on lasers and whether satellites can do forensics on the laser source when they have been dazzled. It was concluded that it is difficult to put a threshold on the wattage of lasers, and that indeed some information can be drawn by a dazzled satellite about the laser source. The discussion on lasers then transitioned to the implications of following Mr. Butt's proposed rules of the road. Specifically, to what extent would each new technology or potential technology in development need to be factored into an agreement?

Moreover, how would one assess the intent behind the technology to make threat assessments? To these questions there were no specific conclusions beyond not banning universally all laser use.

51. The discussion of session five closed with a question of why the United States is seemingly focusing solely on allies, considering that the issue of space security is an international concern. The discussion suggested that the United States is focusing on allies because of national security concerns. That being said, the United States is currently doing a full review of its national space policies and posture. In the interim, the United States will continue to stay actively involved in international discussions through committees like COPUOS.

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