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# Space Security 2009 Moving towards a Safer Space Environment

Conference Report  
15–16 June 2009

UNIDIR/2009/9

**Space Security 2009:  
Moving towards a Safer Space Environment**

**Conference Report  
15–16 June 2009**

UNIDIR  
United Nations Institute for Disarmament Research  
Geneva, Switzerland



UNITED NATIONS

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### **About the cover**

The cover shows the unmanned Progress 14 supply vehicle departing from the International Space Station.

Photograph courtesy of the National Aeronautics and Space Administration.

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UNITED NATIONS PUBLICATIONS

The United Nations Institute for Disarmament Research (UNIDIR)—an autonomous institute 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 donor foundations. The Institute's web site can be found at:

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## FOREWORD

There is a growing recognition by the global public that outer space is critical for human security and economic development. Satellites provide high-speed communications and the use of the Internet, which has been critical to the development of global trade and the growth of robust civil society around the world. Satellites provide imagery that allows the international community to monitor, give warning and provide relief in the event of a natural disaster. Environmental imagery from satellites is increasingly required to monitor the effects of climate change. In short, day to day life—in both developed and developing countries—increasingly relies on access to satellite data.

Elaborating the integral connection between human security on Earth and the safety and security of outer space is at the heart of UNIDIR's efforts to support the work of the Conference on Disarmament (CD) towards prevention of an arms race in outer space. Since 2002, UNIDIR has held annual conferences on different themes in the space security debate: connecting outer space and global security, detailing the nexus between security and the peaceful uses of outer space, preventing an arms race in outer space, building the architecture for sustainable space security, celebrating the Outer Space Treaty, and exploring cooperative approaches to space security.

This year's conference, "Space Security 2009: Moving towards a Safer Space Environment," came at a particularly auspicious time: following hard on the heels of the 29 May 2009 adoption by the CD of a programme of work after 12 years of stalemate. The CD work programme includes a formal working group on the prevention of an arms race in outer space (PAROS), considering all international instruments—including a possible treaty – that might be bent toward that end. Thus, the 2009 conference focused on elements of a potential space security treaty, potential confidence- and security-building measures, international law as it applies and might be applied to space, and emerging issues for space sustainability. A key theme that emerged from the conference is the importance of building a more robust capability to observe and track space objects and debris, and international processes for sharing the ensuing data. So-called space situational awareness is the



foundation stone of any new regime whether voluntary or legally binding to keep space safe for all stakeholders.

On a personal note, I am proud to have been involved in UNIDIR's outer space conferences from the beginning in my previous capacity as head of the Space Security Project at the Center for Defense Information in Washington—and thus well before I took up my position in January 2009 as Director of UNIDIR. These conferences for many years provided one of the few “safe spaces” for discussion of what has been a controversial issue at the CD over many years. In bringing together stakeholders and experts from academia, government, the commercial sector and the military, the annual UNIDIR space conference in Geneva enabled representatives at the CD to explore the complex problems, and even more complex possible solutions, of space security—at a time when formal discussions of the issue were not feasible. Now that the CD has approved the PAROS working group as part of its programme of work, UNIDIR will be undertaking a wider programme of research on space security in order to help forward those discussions. It is our sincere hope that UNIDIR's work will continue to make a substantive contribution to ensuring space security for all.

Theresa Hitchens  
Director  
UNIDIR

## ACKNOWLEDGEMENTS

UNIDIR would like to thank all of the speakers at the conference for their expert and intellectual contributions: Adigun Ade Abiodun, Vladimir Agapov, Phillip Baines, Ben Baseley-Walker, Gérard Brachet, Richard H. Buenneke, Yousaf Butt, Richard DalBello, Andrey Grebenshchikov, Jeffrey G. Lewis, Bruce MacDonald, Andrey Makarov, Tanja Masson-Zwaan, Masami Onoda, Ray Williamson and Zhang Ze. We would also like to thank Ambassador Marius Grinius, Victor Vasiliev and Ambassador Wang Qun for delivering the opening remarks. And for the keynote speeches, we wish to thank Sergei Ordzhonikidze, Director-General of the United Nations Office at Geneva and Secretary-General of the Conference on Disarmament; Hamadoun Touré, Secretary-General of the International Telecommunication Union; and Ambassador Ciro Arévalo-Yepes, Chair of the United Nations Committee on the Peaceful Uses of Outer Space.

UNIDIR would like to express its gratitude to the Governments of Canada, China and Russia, as well as to the Secure World Foundation and The Simons Foundation, for their financial, political and material support of this conference.

In Geneva, UNIDIR would like to thank Ambassador Marius Grinius, Geoff Gartshore and Gillian Frost of the Permanent Mission of Canada; Ambassador Wang Qun, Li Yang and Li Chijiang of the Permanent Mission of China; and Ambassador Valery Loshchinin, Victor Vasiliev, Valery Semin and Alexey Belyakov of the Permanent Mission of the Russian Federation. We are also indebted to Cynda Collins Arsenault, Ray Williamson and Ben Baseley-Walker of the Secure World Foundation, as well as to Jennifer Allen Simons of The Simons Foundation for her unswerving support for this series of conferences.

Anita Blétry, Jason Powers, Tae Takahashi and Kerstin Vignard followed this report through the production phase.



## ABOUT THE SPEAKERS

### **Adigun Ade ABIODUN**

Adigun Ade Abiodun was appointed United Nations Expert on Space Applications in 1981 and served in that position until September 1999 when he retired from the services of the United Nations. In this capacity, he initiated, designed, implemented and supervised, globally, the United Nations Space Applications Programme. Ade Abiodun served as Senior Special Assistant to the President (of Nigeria) on Space Science and Technology (March 2000–June 2003); Chairman of the Board of Directors, Spaceweek International Association (October 2001–October 2004); and Chairman of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) (June 2004–June 2006).

### **Vladimir AGAPOV**

Vladimir Agapov earned a PhD in Theoretical Mechanics and Flight Dynamics in 1998 at the Keldysh Institute of Applied Mathematics where he is currently employed as a Senior Scientist-Researcher. His current research interests are in space debris population measurement, analysis and prediction; trajectory measurement processing; orbital catalogue maintenance for space objects; and space debris sources identification and analysis.

### **Ciro ARÉVALO-YEPES**

Ciro Arévalo-Yepes is the current Chairman of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) as well as the advisor on space matters to the Colombian Ministry of Foreign Affairs. He has worked in the space sector for the past 20 years. Ciro Arévalo-Yepes was one of the main organizers of the Fourth Space Conference of the Americas held in Cartagena, Colombia, in 2002 when the Colombian Space Commission was established. In addition to his diplomatic career, Ciro Arévalo-Yepes is Founder and Director of the Centre of U.S. Studies, CEUS, Bogotá, and was Dean of the Post Graduate International Business Program at the University of Bogotá.

**Phillip BAINES**

Phillip Baines has worked in various mechanical engineering, systems engineering and project management assignments of increasing responsibility from 1982 to 1999. From 1997 to 1999 he was seconded to work at the Department of Foreign Affairs and International Trade of Canada as a Verification Research Officer where he examined technologies for possible application to future arms control agreements and chaired an interdepartmental working group developing a national policy for privately owned remote sensing satellite systems. From 1999 to 2008, Baines developed and implemented the Remote Sensing Space Systems Act to license Canadian remote sensing satellites to promote this sector of the aerospace industry and protect Canada's national security, defence and foreign policy interests in the dissemination of sensitive data. He is currently employed at Foreign Affairs and International Trade Canada as deputy-director, Missiles, Space Security and Conventional Weapons for the Non-Proliferation and Disarmament (Chemical/Biological, Conventional Weapons, Remote Sensing) Division.

**Ben BASELEY-WALKER**

Ben Baseley-Walker is a legal and policy advisor for the Secure World Foundation. He specializes in the relationship between international law, foreign policy and space security. Ben Baseley-Walker is currently focusing on engaging with the international community, especially emerging space states, on building an international cooperative approach to space security.

**G rard BRACHET**

G rard Brachet chaired the United Nations Committee on the Peaceful Uses of Outer Space during the period June 2006–June 2008. Since mid-2008, he is advising the French Ministry of Foreign Affairs on space policy issues. G rard Brachet is the President of the Air and Space Academy (Acad mie de l'Air et de l'Espace) for the period 2009–2010 and he chaired its space committee from 2004 to 2008. He is a member of the International Academy of Astronautics since 1992 and chaired its Commission V: "Space policy, law and economics" in 2006–2007. He is also Vice-President of the International Astronautical Federation (IAF) and chairs its Committee on Liaison with International Organizations and Developing Nations (CLIODN).

**Richard H. BUENNEKE**

Richard Buenneke is the deputy-director for space policy in the Office of Missile Defense and Space Policy, Bureau of International Security and Nonproliferation at the United States Department of State. In his current position, he leads the planning and implementation of diplomatic and public diplomacy activities relating to US national security space policy. Before joining the State Department as a Foreign Affairs Officer in 2007, Richard Buenneke was a senior policy analyst at The Aerospace Corporation, a federally funded research and development centre. In this position, he led Aerospace's support to the planning and strategy directorate of the National Security Space Office (NSSO) in the US Department of Defense's Executive Agent for Space. In this assignment, he served as lead analyst for NSSO's work on commercial satellite protection.

**Yousaf BUTT**

Yousaf Butt is a staff scientist in the High-Energy Astrophysics Division at the Harvard-Smithsonian Center for Astrophysics. Previously, he worked on NASA's orbiting Chandra X-ray Observatory Project and served as a research fellow at the Union of Concerned Scientists' Global Security Program. In 2008, he was awarded a fellowship at the National Academy of Sciences in Washington, DC. He holds a PhD in nuclear physics.

**Richard DALBELLO**

Richard DalBello is responsible for managing Intelsat General's legal team, for leading its government relations and public policy efforts, and for representing Intelsat General before numerous US and international policy bodies. He served previously as president of the Satellite Broadcasting and Communications Association, and for more than three years as the president of the Satellite Industry Association, the voice of the US commercial satellite industry on policy, regulatory and legislative matters. Earlier, DalBello was general counsel for Spotcast Communications Inc., and vice president of government affairs, North America, for ICO Global Communications, a provider of mobile satellite communications services. He also served for four years as the Assistant Director for Aeronautics and Space in the White House's Office of Science and Technology Policy.

**Andrey GREBENSHCHIKOV**

Andrey Grebenshchikov is Third Secretary of the Department for Security and Disarmament Affairs, Ministry of the Foreign Affairs of the Russian Federation. Grebenshchikov is a 2001 graduate of the Nizhny Novgorod Nikolay Lobachevsky State University. In 2004 he received a Master Degree in the French-Russian Programme of International Studies, Sciences Po (Paris)—MGIMO (Moscow) and joined the Russian Ministry of Foreign Affairs where he became the Attaché of the Russian Embassy to the Republic of Mali (August 2004–November 2007). Since December 2007 he has been following military outer space and disarmament issues in the Department for Security and Disarmament Affairs.

**Jeffrey G. LEWIS**

Jeffrey Lewis is director of the Nuclear Strategy and Nonproliferation Initiative at the New America Foundation. The Nuclear Strategy and Nonproliferation Initiative seeks to reduce the role of nuclear weapons in international security and renew the fundamental bargain contained in the Nuclear Non-Proliferation Treaty. Jeffrey Lewis is also a research affiliate with the Center for International and Security Studies at the University of Maryland School of Public Policy (CISSM). Before joining the New America Foundation, Jeffrey Lewis was executive director of the Managing the Atom Project at Harvard University's Belfer Center for Science and International Affairs. Previously, he was a research fellow at the CISSM, executive director of the Association of Professional Schools of International Affairs, a visiting fellow at the Center for Strategic and International Studies, and in the Office of the Undersecretary of Defense for Policy.

**Bruce MACDONALD**

Bruce MacDonald is senior director to the US Strategic Posture Review Commission, a bipartisan body headed by former Secretaries of Defense William Perry and James Schlesinger. He was project leader for the Council on Foreign Relations' study of China, Space Weapons, and US Security. He also served on the Obama presidential campaign's defence policy support team in the areas of military space, missile defence, and other strategic issues. Bruce MacDonald was assistant director for National Security at the White House Office of Science and Technology Policy and served on the National Security Council staff. He was a professional staff member of the House Armed

Services Committee and served in the US State Department's Bureau of Politico-Military Affairs, where he chaired the Interagency START Working Group and served on the US START delegation in Geneva.

**Andrey MAKAROV**

Andrey Makarov is a specialist in the fields of military outer space and security in the General Directorate of the International Military Cooperation of the Russian Ministry of Defence. Since 1980, he has held various posts in the Strategic Missiles and Space Forces Commands. Makarov is a 1985 graduate of the Kharkov Higher Military Command and Engineering College of Strategic Missile Forces and holds the rank of colonel.

**Tanja MASSON-ZWAAN**

Tanja Masson-Zwaan holds a Masters degree in public international law from Leiden University, The Netherlands. She specialized in air and space law and was co-director of the International Institute of Air and Space Law (IIASL) at Leiden University from 1985–1990. In 2004, Tanja Masson-Zwaan worked as an independent consultant on various projects in the fields of air and space law. In 2007, she was elected President of the IIASL where she manages a number of activities promoting knowledge of space law and interaction amongst space lawyers worldwide. In 2008, she returned to the IIASL at Leiden University as deputy-director where she teaches air and space law and manages various activities of the institute.

**Masami ONODA**

Masami Onoda has been engaged in Earth observation and industrial collaboration at the Japan Aerospace Exploration Agency (JAXA). She is currently with the Satellite Applications Promotion Center, seconded to the Group on Observations Secretariat in Geneva. She has a BA in international relations from Tokyo University and a Masters and PhD in global environmental studies from Kyoto University. Her research specializes in treaty monitoring and the use of new technology in policy.

**Hamadoun TOURÉ**

Hamadoun Touré was elected Secretary-General at the International Telecommunication Union (ITU) Plenipotentiary Conference in Antalya, Turkey, in November 2006 and took office on 1 January



2007. He served as director the ITU Telecommunication Development Bureau from 1998 until 2006, where he played a significant role in the World Summit on the Information Society process by launching numerous projects based on partnership building with international organizations, governments, civil society and the private sector. Touré is committed to make ITU an innovative, forward looking organization adapted to meeting the challenges created by the new information and communication technologies environment and to spearhead the Union towards implementing the resolutions of the World Summit on the Information Society and achieving the Millennium Development Goals.

**ZHANG Ze**

Zhang Ze is second secretary in the Ministry of Foreign Affairs, Arms Control and Disarmament Department, the People's Republic of China. He has an extensive experience in multilateral affairs and more specifically in the disarmament field. Zhang was assigned to the Chinese Permanent Mission in Geneva during 2003 to 2008 and has worked extensively with a number of important international bodies, such as the World Health Organization, Human Rights Council and the Conference on Disarmament.

## CONFERENCE REPORT

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).

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.

This year’s conference focused on five primary topics:

- architectures for improving space security;
- ensuring space sustainability: confidence- and security-building measures;
- elements of treaty-based security;
- international law and space security; and
- emerging issues for space sustainability.

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.

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.

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. The agenda of the conference is provided in annex A.

## **KEYNOTE ADDRESS 1**

### **“THE THREATS TO SPACE: AN OVERVIEW”**

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

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

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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**

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.

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.

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

- ban the placement of weapons in space;
- prohibit the testing or use of weapons on satellites so as to damage or destroy them; and
- prohibit the testing or use of satellites as weapons themselves.

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.

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.

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.

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.

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 ADDRESS 2**

### **“TOWARDS A NORM OF NO HARMFUL INTERFERENCE”**

**Hamadoun Touré, Secretary-General, International Telecommunication Union**

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.

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## SESSION 2 TOWARDS A NORM OF NO HARMFUL INTERFERENCE

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.

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.

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.

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.

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”.

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

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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.

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.

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

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:

- the data must be internationally verified;
- the data must be constantly updated with object trajectories;
- there must be common criteria identifying and tracking objects;
- monitored objects must be associated with a country and organization of ownership for responsibility assessment;
- the system must be able to recognize treaty non-compliance and potential close encounters based on trajectories; and
- the system must be able to collect and analyze closely information from all collisions or other incidents.

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.

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%. 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

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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.

Jeffrey G. 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.

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 sea level. 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.

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.

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 longstanding 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).

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.

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### KEYNOTE ADDRESS 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**

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.

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.

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.

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**

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.

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.

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”.

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.

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.

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.

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.

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**

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.

The statement from Mr. Abiodun was followed by Richard H. 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:

- adopt an approach to key infrastructure identification and risk assessment processes;
- coordinate all users and customers of space infrastructure to plan for risk mitigation; and
- integrate commercial satellite communications, remote sensing and other space infrastructure protection plans into national-level plans.

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.

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.

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.

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.

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.



## ANNEX A

### CONFERENCE AGENDA

*The texts of the individual presentations can be found at <[www.unidir.ch/bdd/fiche-activite.php?ref\\_activite=455](http://www.unidir.ch/bdd/fiche-activite.php?ref_activite=455)>.*

#### DAY 1

Monday, 15 June 2009

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##### OPENING SESSION

###### Welcome

Theresa Hitchens, Director, UNIDIR

Ray Williamson, Executive Director, Secure World Foundation

###### Introductory remarks

Ambassador Marius Grinius, Canada

Ambassador Wang Qun, China

Victor Vasiliev, Russia

##### THE THREATS TO SPACE: AN OVERVIEW

Sergei Ordzhonikidze

Director-General, United Nations Office at Geneva

##### SESSION I: ARCHITECTURES FOR IMPROVING SPACE SECURITY

###### Prevention of an arms race in outer space

Zhang Ze

Arms Control Department, Chinese Ministry of Foreign Affairs

###### A confidence- and security-building measures regime

Phillip Baines

Deputy Director, Space Security and Conventional Weapons Non-Proliferation and Disarmament, Department of Foreign Affairs and International Trade Canada

**Best practices for space: a necessary underpinning for space sustainability and security**

G rard Brachet  
President, Air and Space Academy, France

**TOWARDS A NORM OF NO HARMFUL INTERFERENCE**

Hamadou Tour   
Secretary-General, International Telecommunication Union

**SESSION II: ENSURING SPACE SUSTAINABILITY: CONFIDENCE- AND SECURITY-BUILDING MEASURES**

**Commercial data-sharing advances**

Richard DalBello  
Vice President, Government Relations, Intelsat General Corporation

**A prohibition on the testing and use of debris-causing kinetic energy anti-satellite weapons**

Bruce MacDonald  
Senior Director, Congressional Commission on the Strategic Posture of the United States

**International exchange of information**

Andrey Grebenshchikov  
Third Secretary, Department for Security and Disarmament Affairs, Russian Ministry of Foreign Affairs

**SESSION III: ELEMENTS OF TREATY-BASED SECURITY**

**Space situational awareness: building an essential tool for treaty implementation**

Vladimir Agapov  
Senior Scientist-Researcher, Keldysh Institute of Applied Mathematics, Russian Academy of Sciences

**Verification measures: an analysis**

Jeffrey G. Lewis

Director, Nuclear Strategy and Nonproliferation Initiative, New America Foundation

**Status update on the Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects**

Col. Andrey Makarov

General Directorate of International Military Cooperation, Russian Ministry of Defence

**DAY 2**Tuesday, 16 June 2009

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**THE IMPORTANCE OF SPACE SECURITY FOR EMERGING SPACE STATES**

Ambassador Ciro Arévalo-Yepes

Chair, United Nations Committee on the Peaceful Uses of Outer Space

**SESSION IV: INTERNATIONAL LAW AND SPACE SECURITY****The role of international law in improving space security**

Tanja Masson-Zwaan

Deputy Director, International Institute of Air and Space Law, University of Leiden; President, International Institute of Space Law, The Netherlands

**International humanitarian law: is it sufficient for space environment?**

Ben Baseley-Walker

Legal and Policy Advisor, Secure World Foundation

**Environmental law: can it be applied to space?**

Masami Onoda

Satellite Applications and Promotion Center, Japan Aerospace Exploration Agency



**SESSION V: EMERGING ISSUES FOR SPACE SUSTAINABILITY**

**Contributions of space systems to human security**

Adigun Ade Abiodun  
Head, African Space Foundation, Nigeria

**Protection of critical infrastructure**

Richard H. Buenneke  
Deputy Director, Office of Missile Defense and Space Policy, Bureau of  
International Security and Nonproliferation, US Department of State

**The threat of laser ranging to imaging satellites: possible rules of the road**

Yousaf Butt  
Staff Scientist, Harvard-Smithsonian Center for Astrophysics

## ACRONYMS

CD	Conference on Disarmament
COPUOS	United Nations Committee on the Peaceful Uses of Outer Space
GEO	geosynchronous Earth orbit
ISON	International Scientific Optics Network
ITU	International Telecommunication Union
LEO	low Earth orbit
OST	Outer Space Treaty
PAROS	prevention of an arms race in outer space
PPWT	Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects
SSA	space situational awareness
UNIDIR	United Nations Institute for Disarmament Research

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# UNIDIR

“Space Security 2009: Moving towards a Safer Space Environment” is the eighth annual conference held by the United Nations Institute for Disarmament Research on the issues of space security, the peaceful uses of outer space and the prevention of an arms race in outer space.

At this year’s conference, presenters and participants addressed five primary topics: architectures for improving space security, ensuring space sustainability through confidence- and security-building measures, elements of treaty-based security, international law and space security, and emerging issues for space sustainability.