



**UNIDIR**

# **UNIDIR Space Security Conference 2017**

**Celebrating the Outer Space Treaty:  
50 Years of Space Governance and Stability**

**Conference Report**

20–21 April 2017

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**UNIDIR RESOURCES**

## **The organizers**

The **United Nations Institute for Disarmament Research**—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 **Secure World Foundation** is a private operating foundation dedicated to the secure and sustainable use of space for the benefit of Earth and all its peoples. The Secure World Foundation works with governments, industry, international organizations, and civil society to develop and promote ideas and actions for international collaboration that achieve the secure, sustainable, and peaceful uses of outer space.

**The Simons Foundation Canada** is a private foundation committed to advancing positive change through education in peace, disarmament, international law, and human security. Dr. Jennifer Allen Simons established The Simons Foundation Canada in 1985 to foster a greater understanding of global barriers to peace and to work with key parties on a common agenda. The Simons Foundation Canada has been a supporter of the UNIDIR Space Security Conference series since its inception as well as the principal NGO contributor to the *Space Security Index*, an annual publication surveying developments in the use of outer space relevant to its security and sustainability.

## **Note**

This report has been drawn up by Massimo Pellegrino, and constitutes both a summary and analysis of the discussions and exchanges that took place at UNIDIR's Space Security Conference held at the Palais des Nations in Geneva on 20–21 April 2017.

The views and opinions expressed in this document are the sole responsibility of UNIDIR and do not necessarily reflect those of the United Nations and its staff, of the Conference's co-organizers and sponsors, or of the participating entities and organizations. The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries. The report aims solely to reproduce—to the greatest extent practicable and in an organic and comprehensive manner—the content of the presentations and of the ensuing debates.

Where this document reports or refers to statements made by panellists, every effort has been made to provide a fair representation of their views. The actual content and flow of the report, however, may slightly differ from delivery, as it may likewise with panellists' presentations and transcripts; the latter are made available on UNIDIR's website and hereinafter via appropriate links.

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We would also like to convey our gratitude to the United Nations Office at Geneva, under the auspices of which the Conference was held.

Our special thanks go to the Governments of the People’s Republic of China and of the Russian Federation for their financial support to this year’s Conference.

We would also wish to thank the speakers for their presentations, as well as the chairs for having steered and reinforced the discussions. The Conference greatly benefited from the valuable inputs and insights of the many distinguished experts who attended, interaction with whom constituted an invaluable source of information, ideas, and expertise.

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## **Acronyms and abbreviations**

ASAT	anti-satellite
CD	Conference on Disarmament
COPUOS	United Nations Committee on the Peaceful Uses of Outer Space
GGE	Group of Governmental Experts
NFP	No First Placement of Weapons in Outer Space
NGO	non-governmental organization
OST	Outer Space Treaty
PAROS	prevention of an arms race in outer space
PPWT	Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects
SSA	space situational awareness
TCBMs	transparency and confidence-building measures
UNOOSA	United Nations Office for Outer Space Affairs
WMDs	weapons of mass destruction

## Foreword

For almost two decades, the UNIDIR Space Security Conference series has constituted an invaluable 1.5-track forum with a frank and open dialogue on the latest challenges to the security, stability, and sustainability of outer space. While initially intended to brief delegates of the Conference on Disarmament on the policy and politics of outer space security at the multilateral level, it has always more frequently convened an ever-increasing range of established and emerging actors and stakeholders in the space and security communities with a view to building bridges among participants, exploring current trends, and identifying potential avenues for the future. The Conference has played a unique role in raising awareness within the international community on the importance of outer space security and stability, in promoting shared understanding, and in building common ground for action. This distinctive feature has made it attractive to many players that have shown their continued support over the years.

UNIDIR, in cooperation with its partners, has long addressed comprehensive responses to space security and stability threats, recognizing that complex and interconnected challenges require action at multiple levels and over extended timeframes—both to manage crises as they unfold and to address root causes. We have constantly explored connections between our different areas of research, linking traditional security issues with emerging ones, with a cross-cutting approach that is not confined to any particular weapon-specific portfolio.

We have also placed greater emphasis on connecting our own work to the larger set of global security issues as identified by Member States, including through the work of the Conference on Disarmament. In this regard, strategic stability and space security deserve particular attention, as the former is based on accurate command, control, and intelligence provided through communications, reconnaissance, eavesdropping, and early-warning satellites. Continuous and reliable operation of these assets requires that the outer space environment is safe, secure, sustainable, and stable over the long run.

This year's Conference, the sixteenth in the series, entitled "Celebrating the Outer Space Treaty: 50 Years of Space Governance and Stability", sought to explore concerns of, and to reconcile positions among, established and aspiring space-faring nations; achieve mutual understanding on the main concepts of space security and stability; provide overviews and updates from both institutional and non-state actors on the latest developments in and challenges to space security; and offer a number of options for moving forward in terms of multilateral space security diplomacy.

Our expectation and hope is that the resulting report, and any policy implications deriving from the Conference, represent an additional complement to a holistic and multifaceted approach to space security, and contribute to informing space and security policies and doctrines worldwide.

Jarmo Sareva  
Geneva, June 2017

## UNIDIR SPACE SECURITY CONFERENCE 2017

### Celebrating the Outer Space Treaty: 50 Years of Space Governance and Stability

*20–21 April 2017, Palais des Nations, United Nations Office at Geneva (UNOG)*

A Conference organized by the United Nations Institute for Disarmament Research in collaboration with the Secure World Foundation and The Simons Foundation Canada

With support from the Governments of the People's Republic of China and the Russian Federation

## Conference Report

### I. Setting the scene

Fifty years ago, on 27 January 1967, the Outer Space Treaty<sup>1</sup> (OST) was opened for signature and, a few month later on 10 October 1967, entered into force as a legally binding instrument between the signatory States. The OST forms the primary foundation for international space law. Many aspects pertaining to the access to and use of outer space can readily be accommodated within the Treaty's governance framework, from space exploration and international cooperation, to prohibitions on weapons of mass destruction (WMD) and the militarization of celestial bodies. In particular, it establishes the principles of peaceful uses and free exploration of outer space, bans the placement and stationing of nuclear weapons in orbit or on celestial bodies, requires States to avoid contamination of outer space, and makes States responsible for their activities in space and liable for damages. In spite of its overarching nature, the Treaty was developed and agreed upon during the Cold War, at a time when arms control issues were on the top of the agenda of both superpowers and the space age was still at the very beginning.

Since the Treaty's entry into force, the politics of outer space have undergone significant changes and the rules of what is a global common in its own right are evolving rapidly. Over the last 50 years, space activities have increased in both number and importance. The Russian Federation and the United States are no longer the primary users of space services. Today, some 80 public and private entities own or operate more than 1,500 operational

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<sup>1</sup> While commonly referred as the Outer Space Treaty, its full name is the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies.

satellites,<sup>2</sup> providing a wealth of services and benefits for billions of people on Earth. Commercial actors provide vital services (including to the military and intelligence communities<sup>3</sup>) and offer low-cost access to space, thereby changing the geopolitical and geostrategic landscape, and thus reshaping international space policy options.<sup>4</sup>

However, this growing use of space comes with growing security-related concerns, notably the proliferation of space debris, increased crowding of strategic earth orbits, competition for orbital slots, increased demand for and saturation of the radio-frequency spectrum, as well as the possibility of weaponization of outer space and other deliberate threats to space systems. This has been accompanied by an increasing interest among States to strengthen the current outer space regime,<sup>5</sup> with particular regard to the OST. While still largely effective, and developed with peace and security in mind,<sup>6</sup> the OST nevertheless leaves room for proper security discussions on how to increase the stability and predictability of the outer space environment. The attempts being made to introduce further measures to prevent an arms race in space show that a significant majority of States see the existing legal framework as being in need of updating.<sup>7</sup>

Against this backdrop, UNIDIR's 2017 Space Security Conference focused on international space governance and stability with a view to assessing the adequacy of the outer space regime in an evolving space environment, where new threats to space systems and developments in space technologies are believed to be potentially destabilizing and disruptive to the limited stability framework governing the use of outer space.

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<sup>2</sup> UNIDIR extrapolation of data from the Union of Concerned Scientists' Satellite Database, <http://www.ucsusa.org/nuclear-weapons/space-weapons/satellite-database>.

<sup>3</sup> See [https://www.washingtonpost.com/national/health-science/spacex-launches-top-secret-spy-satellite-for-us-government/2017/05/01/1e6835f2-2e62-11e7-a335-fa0ae1940305\\_story.html?utm\\_term=.b051ca5e4d59](https://www.washingtonpost.com/national/health-science/spacex-launches-top-secret-spy-satellite-for-us-government/2017/05/01/1e6835f2-2e62-11e7-a335-fa0ae1940305_story.html?utm_term=.b051ca5e4d59).

<sup>4</sup> Pellegrino, M., Stang, G., "Space Security for Europe", The European Union Institute for Security Studies, 2016, pp.13–14, [http://www.iss.europa.eu/uploads/media/Report\\_29\\_Space\\_and\\_Security\\_online.pdf](http://www.iss.europa.eu/uploads/media/Report_29_Space_and_Security_online.pdf).

<sup>5</sup> The outer space regime includes the five United Nations treaties on outer space, the five General Assembly declarations and legal principles, and a number of other resolutions. For more information, see <http://www.unoosa.org/oosa/en/ourwork/spacelaw/index.html>.

<sup>6</sup> See, for example, the remarks of US President Lyndon B. Johnson at the signing of the OST, <http://www.presidency.ucsb.edu/ws/?pid=28205>.

<sup>7</sup> For an official expression of this assessment see, for example, point 2 of the widely-supported General Assembly resolution on the prevention of an arms race in outer space (A/RES/71/31) [http://www.un.org/en/ga/search/view\\_doc.asp?symbol=A/RES/71/31](http://www.un.org/en/ga/search/view_doc.asp?symbol=A/RES/71/31). For the vote split on this resolution, see <https://gafc-vote.un.org/UNODA/vote.nsf/91a5e1195dc97a630525656f005b8adf/5758415bd438738b8525808f007351a6?OpenDocument>.

## II. Overview of this year's conference

On 20 and 21 April 2017, UNIDIR and its partners the Secure World Foundation and The Simons Foundation Canada convened under the auspices of the United Nations the sixteenth Space Security Conference. The event, held at the Palais des Nations, was also sponsored by the Governments of the People's Republic of China and of the Russian Federation. Over 100 experts from more than 30 countries attended the Conference. Participants included representatives from national governments and space agencies, international and intergovernmental organizations, universities and non-governmental organizations (NGOs), think tanks and research institutes, corporations and start-ups, law firms and media agencies, and civil society.

Entitled "Celebrating the Outer Space Treaty: 50 Years of Space Governance and Stability", the Conference comprised six formal panels, with 24 presentations, and a keynote address. The following topics were addressed:

- national and regional perspectives of space security;
- foundational concepts of space security and stability;
- the OST;
- the changing space and security environments;
- the next generation of space activities;
- current multilateral proposals for enhancing space safety, security, and sustainability; and
- future initiatives and prospects for space security and stability.

In reviewing these issues, participants recognized that in today's complex, contested, and connected world, no one State will be able to impose rules or norms of behaviour unilaterally, or even to act alone, to safeguard the continued access to and use of outer space. Effective diplomacy and well-crafted proposals can instead contribute to creating a community of values for the pursuit of the long-term security and stability of outer space.

### III. Summary and analysis of interventions and discussions<sup>8</sup>

#### Opening Session

**Mr. Jarmo Sareva**, Director, UNIDIR

*Welcoming Remarks* ([audio](#)) ([text](#))

**Dr. Michael Simpson**, Executive Director, Secure World Foundation

*Opening Remarks* ([audio](#))

This year marks both the fiftieth anniversary of the entry into force of the OST and the sixtieth anniversary of the launch of the first artificial satellite Sputnik 1, which marked the beginning of the space age. Since then, the world has seen many actors launch and operate thousands of satellites, around 1,500 of which are currently active. While continuing to support military operations and defence systems, and to be seen as demonstrations of scientific and technological superiority, space infrastructure has become indispensable for an expanding range of activities. Not only are space-based assets and technologies essential for the delivery of both critical and non-security services, but they are also an invaluable source of socioeconomic benefit for humankind and a tool for attaining the 2030 United Nations Agenda for Sustainable Development. Commercial actors are also becoming a major driver in the global space economy, estimated at USD 330 billion,<sup>9</sup> the outlook of which is expected to increase further due to the development of large constellations, small satellites, and low-cost launchers. Space assets are so deeply embedded in modern societies that a day without functioning space capabilities would substantially affect, or even endanger, our lives.<sup>10</sup>

This expansion in space activities has resulted in a heightened focus on security, as these ever-increasing capabilities generate new dependencies and vulnerabilities. With access to space providing many strategic advantages, outer space risks being exposed to additional competition and even conflict, with threats ranging from the potential weaponization of outer space, anti-satellite weapons, and harmful interference, to hybrid warfare operations and cyberattacks. Proximity operations and orbital manoeuvres can also undermine confidence and trust among space actors.

Confronting these threats requires a diverse and flexible set of instruments and capabilities with which to act. As this recognition has spread, the international community has been

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<sup>8</sup> This section reflects the author's interpretations of the interventions and ensuing debates. As such, it does not present any institutional policy of the represented entities, nor does it necessarily represent the personal views and opinions of the author or the speakers themselves.

<sup>9</sup> The Space Foundation, "The Space Report 2015", 2015.

<sup>10</sup> For an assessment of the economic impact on the United Kingdom of a disruption to satellite navigation systems, see [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/619544/17.3254\\_Economic\\_impact\\_to\\_UK\\_of\\_a\\_disruption\\_to\\_GNSS\\_-\\_Full\\_Report.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/619544/17.3254_Economic_impact_to_UK_of_a_disruption_to_GNSS_-_Full_Report.pdf).

engaged in multiple activities to enhance international stability and to ensure the security and predictability of outer space activities. These include both multilateral diplomatic initiatives to strengthen global space governance and to build mutual understanding and trust, as well as technical activities to monitor space objects and to understand what is actually happening in outer space. Nonetheless, progress has been intermittent, and further work is required.

As most space threats, and the available responses, are similar for all space players, common threat perceptions may serve as a basis for developing common responses. The UNIDIR Space Security Conference represents an ideal setting and ongoing resource and communications forum for exchanging views, building common values, and pursuing shared interests, in an effort to seek ways to accommodate differences rather than to eliminate them.

At a time when situational awareness, resilience, and strategic autonomy have become crucial factors for both our public policies and personal lives, addressing space security represents a much-needed complement to shaping more comprehensive and incisive space and security policies. The upcoming ad hoc joint First Committee/Fourth Committee meeting in New York and the UNISPACE+50 conference later next year will continue to investigate challenges and responses to global space governance, offering an additional opportunity to stimulate innovative diplomacy and to strengthen unified efforts in shaping the future of outer space for the next 50 years.

### **Panel 1—National and Regional Approaches to Space Security**

**Mr. Wei Liu**, Division Director, Ministry of Foreign Affairs, People’s Republic of China

*China’s Approach to Space Security* ([audio](#)) ([text & presentation](#))

**Ms. Rachita Bhandari**, First Secretary, Permanent Mission of India to the Conference on Disarmament, Geneva

*India’s Approach to Space Security* ([audio](#)) ([text](#))

**Mr. Bruno Hanses**, Senior Expert for Disarmament, Non-Proliferation and Arms Export Control, European External Action Service, European Union

*The European Union’s Approach to Space Security* ([audio](#)) ([text](#))

**Mr. Andrey Belousov**, Head of Division, Department of Non-Proliferation and Arms Control, Ministry of Foreign Affairs, Russian Federation

*The Russian Federation’s Approach to Space Security* ([audio](#)) ([text](#))

The first panel of the Conference provided an opportunity to clarify the context of the ongoing space security dialogue, and to elaborate on the approaches of some States and regional organizations to their space security positions.

While there is a common interest to enhance space security<sup>11</sup>—a concept that, for many, is primarily connected with preventing an arms race in outer space—the visions and means to accomplish this goal differ. These include both divergent preferences for the mechanisms, methodologies, and settings to address and tackle key space security challenges via multilateral diplomacy, as well as differing approaches and capabilities to increase the resilience of space infrastructure and monitor the space environment.

Nonetheless, there is wide recognition that the current legal regime governing space activities offers little to no guarantees to prevent an arms race in outer space. While the OST bans the placement of WMD in outer space, it is silent on other types of weapons. And, although there is no evidence of space weaponization, the latest technological developments and orientations in military doctrines may suggest that some types of weapons can already be deployed in outer space for use in conflict.

In the decades since the OST's entry into force, there have thus been several attempts to fill this gap in international space law, including through the General Assembly resolution and the Conference on Disarmament (CD) agenda item on the "Prevention of an Arms Race in Outer Space" (PAROS). From the very first discussions until today, there has been a long-running split between efforts led by Eastern States towards legally binding arms control proposals to prevent the weaponization of outer space and the position of some Western States that point to the ineffectiveness of such instruments without proper mechanisms of monitoring, verification, and compliance.<sup>12</sup> Nonetheless, if subscribed to by enough space powers and equipped with proper enforcement mechanisms, well-crafted legally binding treaties are increasingly seen as an effective tool to promote both the preservation of a safe and secure space environment, as well as of the peaceful uses of outer space as a global commons, and as a new frontier for international cooperation.

With limited progress on PAROS and any new treaties, in recent years emphasis has been placed on non-legally binding, voluntary measures and norms of behaviour aimed at enhancing confidence and building trust among space actors. These include both technical guidelines for how to safely conduct space operations, as well as transparency and confidence-building measures (TCBMs) for what and how to communicate about space activities. These instruments can be seen either as useful complements to legally binding treaties, or as a flexible alternative for facilitating harmonization among actors with different perspectives. While they can progress further and develop into customary law, such instruments of soft law might also end up being honoured only with rhetoric or even ignored altogether.<sup>13</sup> Although voluntary measures can have measurable impacts in improving the

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<sup>11</sup> For some definitions of space security see Sheehan, M., "Defining Space Security" in Kai-Uwe Schrogl et al. (eds.), *Handbook of Space Security*, Springer-Verlag, 2015.

<sup>12</sup> Pellegrino, M., Stang, G., "Space Security for Europe", The European Union Institute for Security Studies, 2016, pp.13–14, [http://www.iss.europa.eu/uploads/media/Report\\_29\\_Space\\_and\\_Security\\_online.pdf](http://www.iss.europa.eu/uploads/media/Report_29_Space_and_Security_online.pdf).

<sup>13</sup> Pellegrino, M., Prunariu, D.D., Stang, G., "Security in Space: Challenges to International Cooperation and Options for Moving Forward", Proceedings of the 67th International Astronautical Congress, Guadalajara, Mexico, 26–30 September 2016, <https://swfound.org/media/205876/manuscript-security-in-space-iac-2016.pdf>.

security and long-term sustainability of outer space, compliance remains an important factor in assessing their effectiveness.

These international diplomatic initiatives have been complemented by technical activities, including through the development of the capabilities necessary to detect threats and hazards to space systems (e.g. space situational awareness), and measures to improve the resilience of space infrastructure. The latter can entail hardening space systems against physical and cyber attacks, building redundancy into satellite constellations, or sharing capabilities with third parties to ensure backup service provision. All this can also contribute to strengthening deterrence and strategic stability.

## **Panel 2—Foundational Concepts of Space Security**

**Dr. Rajeswari Pillai Rajagopalan**, Senior Fellow and Head of the Nuclear and Space Policy Initiative, Observer Research Foundation

*Space Security, Deterrence, and Strategic Stability* ([audio](#)) ([presentation](#))

**Mr. Duncan Blake**, Deputy Editor-in-Chief, MILAMOS Project (Manual on International Law Applicable to Military Uses of Outer Space)

*The Outer Space Regime and Global Space Governance* ([audio](#)) ([presentation](#))

**Ms. Victoria Samson**, Washington Office Director, Secure World Foundation

*Space Situational Awareness* ([audio](#))

The second panel of the Conference discussed some of the main foundational concepts of space security and stability, recognizing that, in order to respond to many space security challenges, flexibility is required about working along multiple, non-exclusive axes, among which are deterrence, governance, and space situational awareness (SSA).

Space security is generally understood as a state of affairs in which space actors are free and safe from dangers and threats to the effective access to and use of outer space. There are several means and avenues to pursue an effective space security discourse for preserving the stability and predictability of the space environment.

First, international cooperation and enhanced space regulation, including lawful means for military uses of outer space, can play a major role in preventing mistrust, misunderstanding, and miscalculation with respect to the activities and intentions of space actors. Effectiveness in pushing forward a well-crafted agenda for space governance and security can be enhanced if realistic compromises between the enlightened self-interests of relevant States are put up front. Joined-up approaches that synergistically and concurrently involve efforts in the areas of law, policy, strategy, technology, and economics can effectively contribute to a more regulated and resilient outer space environment. This would be prerequisite for an

effective, sustainable, and rules-based global order for outer space, for which any cynicism about the application of international law would be unjustified.

The MILAMOS<sup>14</sup> project offers one example of how space activities can be conducted without disrupting, and preferably contributing to, the secure and sustainable use of outer space for the benefit of present and future generations. Expected to be published in 2020, the so-called McGill Manual aims to clarify the circumstances in which resorting to the use of force in or through outer space may be permissible in both times of peace and tension. Adherence to the Manual can thus play a significant role in achieving an effective global order for space security, and increasing transparency and trust among actors.

Lawful means for space protection can have measurable impacts, especially if aimed at reducing or eliminating sources of threats. Critics often point to instances of non-compliance with the law as evidence that the law is not effective, ignoring the fact that the vast majority of international relations proceed in an orderly manner consistent with the law and the fact that instances of non-compliance are identified as such. For example, States condemn chemical weapons attacks, regardless of who is actually responsible; it is by virtue of this reaction that norms prohibiting specific behaviours are fortified. There would then be great value if the effectiveness of international law in relation to space security would be measured by the extent to which it reduces or eliminates deliberate and indiscriminate sources of dangers or threats to the advantages that accrue to humanity from the use of space.

Second, in the absence of (successful) multilateral efforts, States may be tempted to rely on deterrence to secure their own interests. This will most likely have a cascading effect, and nurture biases and suspicions among space actors, making international cooperation for space security even more difficult. While deterrence informs the space doctrine for some of the major space powers, there would be some value if any efforts were made to prevent it from formally becoming an established state policy. If not commonly agreed, deterrence in space—and some of the means with which it is accomplished (e.g. anti-satellites weapons)—could undermine strategic stability, and lead to political instability and international tensions. Equally worrisome, however, can be the opposite challenge: untying outer space and deterrence could make the space environment even less safe and secure, as it was the role that space systems have been playing in classical deterrence that has protected them from attack.

Third, SSA can greatly contribute to effective space security. SSA is the capacity to gather a sufficient understanding of the outer space environment such that its future states and evolutions can be determined with a high degree of reliability. By means of radar, telescoping, and space-based assets, SSA provides an almost real-time assessment of activities in outer

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<sup>14</sup> Also known as the McGill Manual, MILAMOS stands for “Manual on International Law Applicable to Military uses of Outer Space”. The project was officially launched in May 2016, and includes nine “consensus” workshops as well as sessions for the Manual’s drafting and review. See <https://www.mcgill.ca/milamos/> for more information about the MILAMOS project.

space, allowing for the detection, identification, tracking, characterization, and cataloguing of space objects. Not only is SSA useful for facilitating access to outer space and conducting safer space operations, but it is also essential for monitoring major risks to space assets (e.g. space debris, conjunctions), so that measures to reduce risks of collision can be taken. Importantly, SSA is fundamental to clarifying whether dual-use capabilities are being misused, to identifying and attributing hostile acts in outer space, and to verifying compliance with international agreements. For example, SSA can help to determine the cause of a satellite malfunction—whether it was a breakdown, an accidental collision, or a deliberate attack. SSA however also has limitations, especially in terms of false positives. Not all warnings may be accurate, with the risk of missing the actual threat. For example, the collision between the Iridium 33 and Kosmos-2251 satellites was predicted with a relatively low likelihood. SSA has also been part of international discussions for a long time. Major multilateral initiatives, for example, refer to SSA as a useful tool for outer space TCBMs. In addition to this, the practicability of any future international instruments to regulate space activities is likely to heavily rely on SSA information, not least because of the possibility it offers to monitor any potential violations.

Currently, only the United States military has a fully developed global SSA system; it also maintains the most complete catalogue of space objects. While there are other national programmes that can contribute to and help to make SSA data more comprehensive, challenges pertaining to data-sharing policies and interoperability need to be overcome. Non-governmental actors, including through private satellite operators, are also a source of SSA data. The Space Data Association, for example, tracks objects in low Earth orbit and geostationary orbit in order to prevent collisions, avoid interference, and locate the sources of harmful interference. Due to the substantial resources required, no actor alone can provide a full SSA picture. Better collaboration, including through a balanced involvement of the industry and non-traditional partners, is needed to provide space actors with the information necessary to act safely, efficiently, and responsibly.

### **Keynote address**

**Dr. David Kendall**, Chair, United Nations Committee on the Peaceful Uses of Outer Space

*Looking Back: 50 Years of the Outer Space Treaty* ([audio](#)) ([presentation](#))

The OST provides the basic legal foundation for the exploration and peaceful uses of outer space and offers a framework for developing space law further. It is largely based on the “Question of General and Complete Disarmament” and the “Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space”, which were adopted by the General Assembly in resolution 1884 (XVIII) of October 1963 and resolution 1962 (XVIII) of December 1963, respectively. Negotiated by 28 Member States on the

Committee on the Peaceful Uses of Outer Space (COPUOS), 62 States were original signatories, while the number of States Parties is currently to 105.<sup>15</sup> The OST contains 17 articles, and includes a number of principles and provisions covering a wide range of space activities. In particular, the Treaty affirms freedom of access, exploration, and use of outer space by all States; claims that outer space is not subject to national appropriation; bans the placement and stationing of WMD in orbit or on celestial bodies; affirms the nature of astronauts as the envoys of humankind; and makes States responsible for national space activities and liable for damage caused by their space objects.

Over the past 50 years, the OST has made a significant contribution to peace, security, and sustainability of outer space. However, the latest advances in science and technology, the growing number of players interested in space capabilities, increased geopolitical tensions, the potential for space weaponization, and the utilization of space for purposes not envisioned in 1967 have put growing pressure on the Treaty. In particular, some of its provisions (e.g. article II) are being interpreted in multiple ways. COPUOS is taking several steps to tackle the issues facing the OST and other United Nations space treaties. These include encouraging States to become adherents of and compliant to the OST, making studies on the status and applications of the five United Nations treaties on outer space, fostering open dialogue and promoting transparency, and developing guidelines and best practices through non-binding instruments, such as those proposed by the Working Group on the Long-Term Sustainability of Outer Space Activities.

Support towards the long-term safety, security, sustainability, and stability of the space environment has also recently come from the G7,<sup>16</sup> including through the statement on non-proliferation and disarmament.<sup>17</sup> Although the statements fail to mention the OST and the fiftieth anniversary it marks this year, looking ahead, the wider strategic reflection promoted by the Office for Outer Space Affairs (UNOOSA) in the lead-up to UNISPACE+50 will provide an additional opportunity to address the changing nature of space activities, including issues related to global space governance and the OST.

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<sup>15</sup> For additional figures and the text of the Treaty see [http://disarmament.un.org/treaties/t/outer\\_space](http://disarmament.un.org/treaties/t/outer_space).

<sup>16</sup> See [http://www.g7italy.it/sites/default/files/documents/G7\\_FMM\\_Joint\\_Communique.pdf](http://www.g7italy.it/sites/default/files/documents/G7_FMM_Joint_Communique.pdf).

<sup>17</sup> See [http://www.g7italy.it/sites/default/files/documents/NPDG\\_Statement\\_Final\\_0.pdf](http://www.g7italy.it/sites/default/files/documents/NPDG_Statement_Final_0.pdf).

### Panel 3—The Outer Space Regime in an Evolving Space Environment

**Dr. Xavier Pasco**, Director, Fondation pour la Recherche Stratégique

*Counterspace Capabilities* ([audio](#)) ([presentation](#))

**Dr. Nathan Weiss**, Senior Scientist, Cyber Division, Israel Aerospace Industries

*Cyber Security of the Space Eco-System* ([audio](#))

**Mr. Douglas Loverro**, Former Deputy Assistant Secretary of Defense for Space Policy

*The Changing Space Security Environment—A Transatlantic View* ([audio](#))

**Dr. Rogel Mari Sese**, Program Leader of the Philippine Space Development Programme, Department of Science and Technology

*New Space Actors* ([audio](#)) ([presentation](#))

The third panel of the Conference focused on the changing space environment, recognizing that there would be great value if the extant outer space regime could evolve in tandem with the changing space and security landscapes, where new trends and threats are believed to be potentially destabilizing and disruptive.

Just as the number of satellites, players, and our dependence on space-based services increase, so too do threats and vulnerabilities. Risks to space systems are diverse and develop rapidly, not least because of the strategic and tactical roles that satellites play. Recent years, however, have seen a shift in the use and testing of counter-space capabilities, from classical anti-satellite kinetic weapons to directed energy weapons and electronic warfare techniques<sup>18</sup>. In particular, lasers, high-power microwaves, and radio-frequency interference are seen as less damaging to the space environment, less traceable, and more tactically flexible, as they can be used to either temporarily degrade signals or even destroy a satellite. In 2012, for instance, Eutelsat experienced some 340 geolocalized jamming events, an increase of one order of magnitude compared to two years earlier. Practice manoeuvres and proximity operations that bring satellites close to others have also been perceived as weapons tests. The difficulty in identifying the source, in interpreting the intent, and in attributing any of these attacks make the use of such technologies all the more tempting, and continue to inform the space strategies and defence planning of the major space actors.

With the emergence of space systems as critical infrastructure,<sup>19</sup> greater attention is being placed on the vulnerabilities of space assets to cyberattack. As such can often be launched

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<sup>18</sup> For a complete taxonomy of threats and hazards to the space infrastructure see Pellegrino, M., Prunariu, D.D., Stang, G., “Security in Space: Challenges to International Cooperation and Options for Moving Forward”, Proceedings of the 67th International Astronautical Congress, Guadalajara, Mexico, 26–30 September 2016, <https://swfound.org/media/205876/manuscript-security-in-space-iac-2016.pdf>.

<sup>19</sup> For additional information on the relationships between space systems and critical infrastructure, see Muresan, L., Georgescu, A., “The Road to Resilience in 2050: Critical Space Infrastructure and Space

at little cost and require limited technical expertise, non-State actors and individuals alike can pose a formidable threat. The potential for damage and disruption is significant, and ranges from simple interference and signal degradation, to denial of services, data theft, and hostile takeover. Interconnectivity among systems increases further the risk of cyberattack, as hackers have a larger number of individual nodes and weak points through which to gain access to critical subsystems.

Due to its inherent nature, outer space offers multiple opportunities to hackers: the hardware, software, and data on the satellite in orbit; the information transmitted via the data and communications links; and the control and data centres on the ground—the latter being the most vulnerable part of the whole infrastructure. In today's connected world, all aspects of the system need to be considered, including the supply chain of the huge number of digital components that go into the manufacture of ground stations, satellites, communication systems, and launch stations. Furthermore, the “cyber–physical” threat, whereby a cyber-attack can not only do physical harm to equipment but can also lead to significant collateral damage and loss of life, needs to be carefully assessed. A holistic approach to the cybersecurity of the space ecosystem that goes beyond the (very essential) protection of individual components but also considers protection of the system as a whole at the individual, corporate, national, and international levels is needed. There can be immense value if national cyber situational awareness incorporates not only the traditional critical infrastructure and defence sectors, but also the space sector as a whole. In the meantime, cyber protection needs to be built upon effective end-to-end encryption, systematic connections to cybersecurity early warning centres and computer emergency response teams (CERTs), software updates, protocols, and cybersecurity awareness. Cooperation between manufacturers, suppliers, operators, stakeholders, and other partners in the space ecosystem will eventually prove to be beneficial.

Besides monitoring the evolution of these specific forms of threats, the international space community is also paying attention to how new space actors intend to approach space security challenges. New entrants often dismiss the issues of orbital congestion, space debris, and weaponization of outer space—their primary goal is to launch satellites in order to develop and progress further, as they see outer space as a necessity rather than a luxury. As this approach could undermine the long-term sustainability of outer space, it is vital that new space actors carefully plan and assess their actions in advance.

One of the advantages for new entrants into outer space is the opportunity to craft their own policy by building on that of established space actors and incorporating some of the main provisions in the early stages of their development programmes. Not only would this sharing of good practices enable new actors to progress rapidly with minimal resources, but communicating about one's intentions (and priorities) could also enhance confidence and reduce the risk of misunderstanding and miscalculation. Ideally, this form of transparency

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Security”, *RUSI Journal*, vol. 160, no. 6, December 2015, pp. 58–66,  
<http://dx.doi.org/10.1080/03071847.2015.1123948>.

could lead to greater adherence to the key space treaties. Compliance with international agreements would be a positive step for new space actors to affirm their own commitment to establishing a presence in the space arena while remaining open to dialogue and international cooperation for the exclusively peaceful uses of outer space.

In this regard, the Philippines can serve as a good example. They are signatories of three space treaties, currently working towards the ratification of some space agreements and investigating the possibility of becoming party to the missile technology control regime. The Philippines are increasingly seen as a responsible member of the space community committed to advancing space security. However, this responsibility needs to be shared at both the regional and international levels. While well-structured coordination among States in the developing regions of the world could lead to efforts to prevent and mitigate space debris, space-faring nations are those equipped with the expertise and political influence necessary to develop and enforce both measures for preventing the weaponization of outer space as well as technical guidelines for space safety and sustainability.

In sum, the challenges and responsibilities of ensuring a safe, secure, sustainable, stable, and predictable space environment remain with both established and emerging space actors. Clear recognition of the role of each player can ensure that the benefits of outer space will remain accessible to future generations.

#### **Panel 4—Next Generation of Space Activities**

**Mr. Nobu Okada**, Chief Executive Officer, Astroscale

*Active Debris Removal and On-Orbit Satellite Servicing* ([audio](#))

**Prof. Tanja Masson-Zwaan**, Deputy Director, International Institute of Air and Space Law, Leiden University

*Resource Extraction* ([audio](#)) ([presentation](#))

**Ms. Joanne Wheeler**, Partner, Bird & Bird

*Large Constellations and Small Satellites* ([audio](#))

The fourth panel of the Conference provided an opportunity to investigate and clarify some of the security implications deriving from the next generation of space activities, notably on-orbit satellite servicing, active debris removal, resource extraction, large constellations, and small satellites.

The single biggest threat in terms of the creation of long-lived space debris does not come from actions taken in outer space during hostilities, but rather from the unintentional collision of objects in outer space, specifically a large object with a small object. Many calculations have been done and they all come to the same conclusion: the risk of collision between objects in space may be decreased by an order of magnitude if 10 large objects per

year are cleaned up. In addition to mitigation measures, end-of-life services and active debris removal are increasingly seen as urgent measures, but technical and legal challenges relating to the capture of space objects and to the definition of space debris still need to be overcome. Importantly, the dual-use potential of such technologies can also exacerbate relations among space actors, as they have increasingly been seen as a front to test and deploy co-orbital space weapons. Nonetheless, the space community broadly is aware that this is a mandatory step to keep the level of space debris at an acceptable level.

Overall, the space industry is committed to engaging in activities to mitigate space debris, but the lack of specific rules brings uncertainty. The future development and deployment of such technologies may become more urgent should the debris problem continue to worsen, but a set of standards and norms describing how to safely conduct such operations and clarifying rights and obligations for all parties involved would be helpful.

The prospect for extraction of outer space resources is also raising serious concerns within the space and security communities. With several companies planning to mine resources, including those from asteroids and other celestial bodies, the outer space environment faces additional strategic competition, with potentially destabilizing effects among major players. Currently, there is no agreed legal regime regulating space resource activities; while article II of the OST<sup>20</sup> explicitly prohibits national appropriation of outer space, it is being interpreted in multiple ways, as national appropriation of a territory and exploitation of its own resources are seen by many as separate concepts. Article I of the OST<sup>21</sup> is also cited as a reference by supporters of space resource use. The Moon Treaty, on the other hand, is the only treaty addressing commercial uses of space. While it allows for the collection of lunar samples under certain circumstances and following specific principles, the treaty also states that an international regime to govern their exploitation needs to be established when such exploitation becomes feasible.<sup>22</sup> However, only 11 States have signed the Moon Treaty, which has slowed acceptance of the agreement as genuine customary international law.

In the absence of an international legal regime detailing provisions about the exploitation of extraterrestrial natural resources, national regulatory initiatives develop. Several efforts have been made to provide legal certainty to pioneers and to support national industry.<sup>23</sup> These includes the 2015 Position Paper of the International Institute of Space Law and the 2015 Hague Space Resources Governance Working Group. The legal subcommittee of

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<sup>20</sup> Article II of the OST states that “Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means”.

<sup>21</sup> Article I of the OST refers to freedom of access, exploration, and use of outer space, including the Moon and other celestial bodies, by all States.

<sup>22</sup> See article XI of the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, also known as the Moon Agreement or the Moon Treaty, <http://disarmament.un.org/treaties/t/moon>.

<sup>23</sup> See, for example, the 2015 US Space Resource Exploration and Utilization Act, <https://www.congress.gov/bill/114th-congress/house-bill/1508>. Luxemburg is also in the process of adopting a similar law.

COPUOS has also included an agenda item on the topic for its 2017 and 2018 sessions. While national (and personal) perspectives may differ on certain points, these initiatives have shown that there is an interest in establishing a regulatory framework to enable the sustainable exploitation of space resources on an equitable basis. A wide range of legal issues must be addressed however, such as the lack of a uniform legal definition of outer space, celestial bodies, and their resources, and the absence of an international legal regime regulating the exploitation of outer space by the private sector.<sup>24</sup> The potential request for a binding regulatory framework can also become an additional issue for disagreement, as do the risks (and threats) connected with the dual-use potential of these new activities and technologies. Space resource activities can ultimately bring great prospects for humankind, but also can pose significant challenges to space safety and security, and undermine international stability.

Equally disruptive could be the development and launch of large constellations and small satellites. While they are not explicitly part of the outer space regime, small satellites and large constellations are key components of the future space environment. In compliance with the OST, States will still be responsible for national space activities, even for those conducted by non-governmental entities, and liable for damages. For these game-changing activities, a balance must be found between reputational, safety, security, and liability risks and the encouragement of entrepreneurship and commercialization of outer space.

Licensing of large constellations and small satellites requires a well-crafted and comprehensive approach. For example, a key concern relates to space debris resulting from the deployment of such constellations, and the potential for conjunctions with both operational and dismissed satellites. As the population of space objects increases, current mitigations guidelines and standards would need to be reviewed. Importantly, as the launch of constellations can pose serious safety risks, entities responsible for conducting such space operations need to understand the full spectrum of hazards involved, from the design phase to post-mission disposal, and provide evidence of how operations can be performed with no harm to public. At the same time, adherence to and compliance with international law and other measures, such as those pertaining to the radio-frequency spectrum, remain an important factor. It would be beneficial if national and international legal frameworks could help to encourage the adoption and spread of these future activities, balancing benefits with risks, and innovation with a sustainable use of outer space. While the possibility to enhance outer space treaties with additional legally binding provisions seems slim, national legislation and licensing regimes remain key factors in making these technologies a catalyst rather than destabilizing factors.

In sum, establishing and agreeing upon norms and rules for how space operations and activities can avoid indiscriminate harm would be a worthwhile endeavour in order to protect space systems and to safeguard the outer space environment, if not in war, at least

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<sup>24</sup> Volynskaya, O., "Space resources exploitation from the international and domestic law perspectives: the Russian approach", Proceedings of the 67th International Astronautical Congress, Guadalajara, Mexico, 26–30 September 2016, <https://swfound.org/media/205876/manuscript-security-in-space-iac-2016.pdf>.

in peace. In particular, the development of rules for sensible space traffic management could prove to be beneficial; likewise the development of guidelines for unguided and unmanoeuvrable satellites and whether the 25-year rule is applicable for objects that function for a few months only.

### **Panel 5—Multilateral International Initiatives: Status Update and Ways Forward**

**Mr. Li Zhang**, Second Secretary, Ministry of Foreign Affairs, People’s Republic of China  
*Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects* ([audio](#)) ([text & presentation](#))

**Mr. Bruno Hanses**, Senior Expert for Disarmament, Non-Proliferation and Arms Export Control, European External Action Service, European Union  
*International Code of Conduct for Outer Space Activities* ([audio](#)) ([text](#))

**Dr. David Kendall**, Chair, United Nations Committee on the Peaceful Uses of Outer Space  
*COPUOS Working Group on the Long-Term Sustainability of Outer Space Activities* ([audio](#)) ([presentation](#))

**Mr. Andrey Belousov**, Head of Division, Department of Non-Proliferation and Arms Control, Ministry of Foreign Affairs, Russian Federation  
*No First Placement of Weapons in Outer Space* ([audio](#)) ([text](#))

The fifth panel of the Conference discussed on-going diplomatic initiatives aimed at strengthening the existing multilateral regime governing space activities, and elaborating on the architectures and rationales surrounding current proposals.

As of today, no single forum is mandated to address all dimensions of space security, but multiple United Nations bodies have become essential forums for discussing these issues, each with its own mandate, remit, and rules. These include the General Assembly, especially the First and Fourth Committees and the Disarmament Commission, the CD, COPUOS, and the International Telecommunication Union. Multilateral discussions on risks to space systems and services take place in all of these venues and can be classified into two main categories: arms control perspectives and approaches for responsible space behaviour.<sup>25</sup> While the former aims to prevent the weaponization of outer space, the latter focuses more on the degree of care with which space activities are conducted and communicated, rather than on which kinds of orbital systems are actually deployed in outer space.

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<sup>25</sup> Pellegrino, M., Prunariu, D.D., Stang, G., “Security in Space: Challenges to International Cooperation and Options for Moving Forward”, Proceedings of the 67th International Astronautical Congress, Guadalajara, Mexico, 26–30 September 2016, <https://swfound.org/media/205876/manuscript-security-in-space-iac-2016.pdf>.

The consideration of space security from an arms control perspective has a long track record.<sup>26</sup> Initiatives on the prevention of an arms race in outer space have been discussed at the CD since 1981, but it was only towards the end of the last decade that new impetus was given. On 12 February 2008, the Russian Federation and China jointly submitted to the CD a draft treaty on the “Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects” (PPWT), an updated text of which was submitted in June 2014.<sup>27</sup> Its declared aim is to maintain the security of outer space and fulfil the principle of peaceful use of outer space, extending the OST’s ban on WMDs to conventional and other types of weapons. In particular, the draft PPWT calls upon adhering States to not place weapons in outer space and to refrain from the threat or use of force against space objects, including through ground-based assets, while recognizing the right of self-defence according to the Charter of the United Nations.<sup>28</sup> With its balance between rights and obligations, the PPWT could constitute a deterrent to arms proliferation and a preventative measure to avoid an arms race in outer space. At present, the draft treaty does not propose any verification regime for effective monitoring and compliance, but it contains some elements for verification and resolving grievances in the form of consultative mechanisms. Importantly, there are some definitional issues that need to be further addressed—the term “weapon in outer space”, for example, is still an issue of disagreement given the dual-use nature of many space technologies, on which additional insights would be welcome.

Efforts to push the treaty have found some success in the United Nations. Since 2014, when it was first voted upon in the General Assembly, the Russian initiative on “No First Placement of Weapons in Outer Space” (NFP) has passed with only four States in opposition and currently enjoys formal support by 45 States as co-sponsors and full-scale participants.<sup>29</sup> The rationale behind this non-binding resolution is to establish the conditions to maintain outer space as a peaceful environment by asking States, especially those with relevant capabilities, to refrain from being the first to deploy weapons in outer space, so that this issue could be resolved at least politically. This initiative has some similarities with both the PPWT and other efforts in the CD under the PAROS agenda item, to which it explicitly refers to, and can be seen as a stepping stone towards negotiations of the more ambitious PPWT. Its value lies in its politically binding nature, making it a sort of TCBM that aims to eliminate mistrust and miscalculation among space actors without necessarily necessitating intrusive verification mechanisms. If subscribed to by a significant group of States, this TCBM could constitute a

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<sup>26</sup> See Meyer, P., “The CD and PAROS—A Short History”, UNIDIR, April 2011, <http://www.unidir.org/files/publications/pdfs/the-conference-on-disarmament-and-the-prevention-of-an-arms-race-in-outer-space-370.pdf>.

<sup>27</sup> For the updated text, see <https://documents-dds-ny.un.org/doc/UNDOC/GEN/G14/050/66/PDF/G1405066.pdf>.

<sup>28</sup> See article 51 of the Charter of the United Nations, <http://legal.un.org/repertory/art51.shtml>.

<sup>29</sup> From 2014 to 2016, the number of States in favour and abstaining ranged from 126 to 130 and from 46 to 48, respectively (see <https://gafc-vote.un.org/>). For details on the text of the resolution and the voting split on the occasion of the seventy-first General Assembly session, see <https://gafc-vote.un.org/UNODA/vote.nsf/91a5e1195dc97a630525656f005b8adf/7add3db2e2f79dfa8525808f007432ba?OpenDocument&Highlight=0,first,placement>.

political roadblock to the weaponization of outer space. However, doubts about the viability of the NFP as a measure to genuinely contribute to space security have been raised. Critics have pointed out that it may encourage States to pre-emptively develop offensive space capabilities and place them in space once a party first breaks the agreement. Deprived of the adjective “first”—which seems to legitimize the weaponization of outer space—should any State introduce weapons in outer space—the NFP initiative may encounter different (and more positive) reactions. Nonetheless, the voting split in the General Assembly is worth noting when considering how the international community sees space security moving forward. These diplomatic differences are problematic and remain a critical factor in shaping the international politics on the security of outer space, potentially affecting efforts to push forward and win support for other space security initiatives.

With relatively limited progress on arms control in outer space, greater emphasis has been placed on principles of responsible behaviour in outer space. They consist of both technical guidelines for how to conduct space operations with safety and security in mind, as well as TCBMs for how and what information to share about space activities with the aim of creating mutual understanding and trust. Proposals for responsible space behaviour to date have involved a set of voluntary, non-legally binding measures that focus more on the impacts that space operations can have on the surrounding environment, rather than on what tasks individual satellite systems undertake, including potentially destabilizing activities (e.g. military activities). Without the pressures and expectations of legally binding instruments, voluntary measures have the advantage of being more easily negotiable and can serve as a “bridgehead” towards stronger international instruments. If adhered to by the right number of space actors, they can also lead to a culture of cooperation and openness to collective security ideals.

Voluntary initiatives for promoting responsible behaviour in outer space has gained momentum, in part due to concern an ASAT test could create thousands of items of long-lived debris.<sup>30</sup> In particular, the COPUOS Working Group on the Long-Term Sustainability of Outer Space Activities has been working since 2010 to examine and propose measures that could enhance space safety and sustainability in all of their aspects. The Working Group is preparing a report on the long-term sustainability of outer space activities—reviewing today’s good practices, operating procedures, technical standards, and safety policies—upon which a set of voluntary guidelines will be developed for application by all space actors. The Working Group, welcoming inputs from state delegations and other United Nations bodies, has so far produced 30 guidelines and reached consensus on 12 of them, which are now ready for States and intergovernmental organizations to consider implementing on a voluntary basis.<sup>31</sup> Work continues on the preambular text and on the other 18 guidelines—as well as on procedures for reviewing, amending, and revising the text—with a view to

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<sup>30</sup> See [https://swfound.org/media/9550/chinese\\_asat\\_fact\\_sheet\\_updated\\_2012.pdf](https://swfound.org/media/9550/chinese_asat_fact_sheet_updated_2012.pdf).

<sup>31</sup> For a recent (February 2017) version of the guidelines for the long-term sustainability of outer space activities, see <https://cms.unov.org/dcpms2/api/finaldocuments?Language=en&Symbol=A/AC.105/L.308>.

reaching consensus on a final report and a full compendium of agreed guidelines to be adopted by COPUOS and referred to the General Assembly at its seventy-third session in 2018. An early agreement on these additional (and more demanding) proposed guidelines could generate positive momentum and facilitate their adoption later next year.

In parallel, but on a different track, the European Union has been engaged in the development of an International Code of Conduct for Outer Space Activities.<sup>32</sup> The rationale behind the Code is to define clear principles of responsible space behaviour. While it is intended for both military and civilian actors, arms control remains beyond its scope. Rather, the proposal is based on a non-legally binding instrument to which adhering States voluntarily commit themselves to increase transparency and to establish standards of responsible behaviour across the full range of space activity. Although there is widespread support for a code of conduct regulating space activities, the European Union encountered some resistance, especially due to some provisions contained in its proposal and the process surrounding its development. In spite of that, the proposal for a code of conduct has offered a platform outside of the United Nations to discuss space security issues and has allowed aspiring space-faring nations to participate. Taking stock of the inputs received from 2013 to 2015 and the progress being made with respect to other international initiatives, the European Union and its member States reassessed their objectives and approach, concluding that they will continue to work on principles for responsible space behaviour,<sup>33</sup> with a small group of EU member States taking up a process within the United Nations on a non-legally binding agreement for both military and civilian activities. In spite of this commitment, however, the Code remains in a state of suspended animation and its future is unclear.

Many of these on-going efforts give expression to, and have been noted in, and endorsed referred to by, the Report of the Group of Governmental Experts (GGE) on Transparency and Confidence-Building Measures in Outer Space Activities (hereinafter the GGE Report on outer space TCBMs).<sup>34</sup> The work of the GGE, conducted by 15 national experts under the chairmanship of the Russian Federation, was primarily focused on two main types of outer space TCBMs for implementation by all States and international organizations on a voluntary basis. The first includes information exchange on space policies and programmes, space military expenditures, and registrations and orbital parameters of space objects. The second includes notifications related to outer space activities, such as launches, manoeuvres, re-entries, malfunctions, break-ups, and emergencies. The Report also encourages states to open their space launch sites and facilities to visits, create consultative mechanisms to ensure continued dialogue, and pursue cooperation and outreach activities, including with aspiring and non-space powers. In spite of the limited representation of the expert group,

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<sup>32</sup> For the latest version of the text of the proposal for an International Code of Conduct for Outer Space Activities, see [https://eeas.europa.eu/sites/eeas/files/space\\_code\\_conduct\\_draft\\_vers\\_31-march-2014\\_en.pdf](https://eeas.europa.eu/sites/eeas/files/space_code_conduct_draft_vers_31-march-2014_en.pdf).

<sup>33</sup> See p. 42 of the European Union's Global Strategy on Foreign and Security Policy, [http://eeas.europa.eu/archives/docs/top\\_stories/pdf/eugs\\_review\\_web.pdf](http://eeas.europa.eu/archives/docs/top_stories/pdf/eugs_review_web.pdf).

<sup>34</sup> For the full Report of the GGE, see [http://www.un.org/ga/search/view\\_doc.asp?symbol=A/68/189](http://www.un.org/ga/search/view_doc.asp?symbol=A/68/189).

the GGE Report was universally welcomed by the international space and security communities. In particular, the work of the GGE was viewed by many States as a pragmatic step forward on the politics of space security at the multilateral level and as a model for how to quickly and effectively produce a consensus report. However, implementation of the Report's recommendations has been slow, especially by those parties which had expressed diplomatic support. A major focus going forward is how to effectively ensure compliance with the identified set of TCBMs and other recommendations.

## **Panel 6—Looking ahead**

**Mr. Hellmut Lagos**, Chair, Legal Subcommittee, United Nations Committee on the Peaceful Uses of Outer Space

*GGE on Space TCBMs: What Next?* ([audio](#)) ([text](#))

**Ms. Tanya Keusen**, Associate Programme Officer, United Nations Office for Outer Space Affairs

*Safety, Security and Sustainability of Outer Space Activities: UNOOSA and TCBMs Looking Forward* ([audio](#)) ([presentation](#))

**Dr. Michael Simpson**, Executive Director, Secure World Foundation

*Secure World Foundation's Handbook for New Actors in Space* ([audio](#))

**Ambassador (Ret.) Paul Meyer**, Senior Fellow, The Simons Foundation Canada

*The Outer Space Treaty and the Future of Space Security Diplomacy* ([audio](#)) ([text](#))

The sixth panel of the Conference explored how space security can move forward, offering a number of potential avenues for the future.

Despite the increasing interest of States and regional organizations in developing additional measures to supplement the OST regime, success has been sporadic. The few major diplomatic initiatives have tended to highlight the divergent views of major space powers rather than to reconcile them. To facilitate further international cooperation for space security, flexibility may be required while working across a few, non-exclusive areas of action.

First, ensuring compliance with international agreements and principles of international law would be essential. There would be great value if space actors review and implement on a voluntary basis, to the greatest extent practicable and in a manner consistent with national interests, proposals for responsible behaviour in outer space. While a review of how these principles have been applied can motivate space actors to be compliant and to set the path for others to follow, it still appears premature to conduct such an assessment in the short run. Today, no space actor has systematically implemented voluntary measures and the outcome of such a review may not be very inspiring. Sustaining the momentum generated

by the GGE Report and integrating all current proposals in a constructive political process can instead help to balance desires with the reality of the current political climate. The work of UNOOSA and the Office for Disarmament Affairs on the implementation of outer space TCBMs can also be seen as a positive step in this direction. In 2016, the Inter-Agency Meeting on Outer Space Activities (UN-Space) issued a special report (A/AC.105/1116) that includes information on how United Nations entities support States in the implementation of space TCBMs.<sup>35</sup> Earlier this year, the Office for Disarmament Affairs prepared a report (A/72/65) on the coordination of outer space TCBMs in the United Nations system, reproducing the substantive text of the special report by UN-Space, and incorporating updates and views received from the contributing entities and some States, respectively.<sup>36</sup>

Second, paying attention to the needs of new space actors would be beneficial. Capacity-building can be a significant tool for boosting the growth of newcomers in outer space, while limiting potential negative consequences that might be due to the willingness to develop and to progress quickly. Equipping newcomers with the technical, political, and legal expertise necessary to integrate space security thinking into their strategic planning can contribute, on the one hand, to overcoming mistrust and suspicions and, on the other hand, to safeguarding the use of outer space for future generations. All this may come in the form of dedicated efforts to introduce to new space actors the main principles of international laws, as well as norms and good practices for secure, safe, and sustainable activities in outer space. The initiative pursued by the Secure World Foundation with the development of a handbook for new space actors is a very promising initiative in this field.<sup>37</sup> Complemented with ad hoc plans for managing space security risks and supported by other existing efforts, such as those by UNOOSA, capacity-building measures can ensure that space programmes and projects of new actors are developed with security thinking in mind, from the design phase to post-mission operations. This inclusive approach, especially when conducted by state actors, may also gain support for their own multilateral diplomatic initiatives.

Third, international multilateral cooperation remains a crucial factor in pursuing and building common ground for shared action, as well as in identifying and shaping joint responses to space security challenges. On 20–21 June 2018, the international space community will gather in Vienna for the UNISPACE+50 conference to articulate a new long-term vision for outer space, with a view to investigating challenges and responses to global space governance and addressing gaps in the legal regime for outer space.<sup>38</sup> The conference is also expected to become a milestone for the long-term development of COPUOS and related stakeholders, and offers a unique opportunity to strengthen unified efforts in

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<sup>35</sup> See <http://undocs.org/en/A/AC.105/1116>.

<sup>36</sup> See <http://undocs.org/A/72/65>.

<sup>37</sup> An electronic version of the Secure World Foundation's Handbook can be obtained at <https://swfound.org/handbook/>.

<sup>38</sup> For a synopsis of the UNISPACE+50 thematic priorities, see [http://www.unoosa.org/documents/pdf/unispace/plus50/thematic\\_priorities\\_booklet.pdf](http://www.unoosa.org/documents/pdf/unispace/plus50/thematic_priorities_booklet.pdf).

shaping the future of space governance,<sup>39</sup> as the interconnections with the work of the Working Group on the Long-Term Sustainability of Outer Space Activities show. It is disconcerting however to compare the extensive preparations underway for UNISPACE+50 with the inaction—especially on the part of the three depository governments of the OST—in officially marking the treaty’s major anniversary. Similarly, the lack of proper arrangements for the second ad hoc joint First Committee/Fourth Committee meeting, to take place in October 2017 in New York, should raise alarm bells. It would be beneficial if UNOOSA and the Office for Disarmament Affairs formed a working group to develop a substantive agenda for this joint session and to organize consultations in Vienna, Geneva, and New York to solicit input from States. While no one would contest the positive nature of the GGE Report, it remains to be seen some four years later whether recommendations of greater significance for space security than half-day joint session at United Nations Headquarters will be taken up by States and implemented.

To push forward an international agenda on space security, it is important that appropriate forums of discussions be identified. The PPWT, for example, has also suffered from the lack of a relevant subsidiary body within the CD to discuss it. This problem has been compounded by the refusal of its sponsors to bring the treaty before any other multilateral forum, reflecting a fixation on forum rather than functionality. The sponsors can reconsider this self-imposed constraint and, if they continue to see value in the PPWT, they might consider to organize some other forums for its consideration.

To re-energize international discussions on space security, some work can also be done to promote and to revitalize the main ideas contained in the European Union proposal for an International Code of Conduct. The most promising elements of the Code are its provisions for institutional support and on-going state discussion of its implementation. Rather than repackaging the Code as a set of principles for responsible behaviour via a General Assembly resolution, there would be more value if its innovative provisions were reintroduced as part of a General Assembly-mandated open-ended negotiation, so as to give the Code the status and legitimacy it would need to be a productive complement to the existing outer space regime. This approach may also ensure future buy-in of a broader and cross-regional set of sponsoring States, beyond the EU member States themselves that would still play a key role.

In short, the future for space security diplomacy is fraught at the current stage. Differences among leading space powers are being accentuated, while threat perceptions and military programmes based on them are increasing. All of this can provide ready substantiation for a building up of national counterspace capabilities, which would in turn fuel an incipient arms race that the international community has pledged to prevent. While it might not be possible for space actors to share common perceptions of international security, the

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<sup>39</sup> See <http://www.unoosa.org/oosa/en/ourwork/unispaceplus50/index.html> and the documents therein for more information on UNISPACE+50.

existence of political will can help find common ground for future consensus that can be acceptable for the interests of different States.

## **Closing Session**

**Ambassador (Ret.) Paul Meyer**, Senior Fellow, The Simons Foundation Canada

*Closing Remarks ([audio](#))*

The neglect of the OST by the very States that championed its creation points to a disturbing trend in contemporary space security affairs, one that ignores the constraints on the behaviour of actors in space in favour of emphasizing unrestricted freedom of action and the development of national security-related capabilities that could support unilateral moves. The international community needs to re-establish a common purpose with respect to outer space. The fiftieth anniversary of the OST provides a unique occasion to reaffirm the “peaceful purposes” orientation of the treaty. It is not too late for one of the 105 signatories to host what would be the first ever meeting of its States Parties. A fiftieth anniversary meeting would also be a natural focal point for a re-energized campaign to promote universalization of the treaty—starting with the 24 States that have signed but not ratified the treaty. Such a meeting of States Parties would constitute both a fitting commemoration of this key treaty, as well as serve as an impetus for reinstating international cooperation as the pre-eminent aim for the outer space regime.

## **ANNEXES**



## 2017 SPACE SECURITY CONFERENCE

**“Celebrating the Outer Space Treaty: 50 Years of Space Governance and Stability”**

20–21 April 2017, Palais des Nations, United Nations Office at Geneva

A Conference organized by the United Nations Institute for Disarmament Research (UNIDIR) in collaboration with the Secure World Foundation and The Simons Foundation Canada

With support from the Governments of the People’s Republic of China and the Russian Federation

### Conference Programme

#### Thursday, 20 April 2017

**09:00 – 09:30** *Welcome coffee*

**09:30 – 10:00** **Opening Session**

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09:30 Welcoming Remarks

**Mr. Jarmo Sareva**, Director, United Nations Institute for Disarmament Research

09:45 Opening Remarks

**Dr. Michael Simpson**, Executive Director, Secure World Foundation

**10:00 – 11:30** **Panel 1 – National and Regional Approaches to Space Security**

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*Chair: Ambassador (Ret.) Paul Meyer, Senior Fellow, The Simons Foundation Canada*

10:00 China

**Mr. Wei Liu**, Division Director, Ministry of Foreign Affairs, People’s Republic of China

10:15 India

**Ms. Rachita Bhandari**, First Secretary, Permanent Mission of India to the Conference on Disarmament, Geneva

10:30 The European Union

**Mr. Bruno Hanses**, Senior Expert for Disarmament, Non-Proliferation and Arms Export Control, European External Action Service, European Union

10:45 The Russian Federation

**Mr. Andrey Belousov**, Head of Division, Department of Non-Proliferation and Arms Control, Ministry of Foreign Affairs, Russian Federation

11:00 Q & A

**11:30 – 11:45** **Coffee Break**

## **11:45 – 13:00 Panel 2 – Foundational Concepts of Space Security**

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*Chair: Ms. Victoria Samson, Washington Office Director, Secure World Foundation*

11:45 Space Security, Deterrence and Strategic Stability

**Dr. Rajeswari Pillai Rajagopalan**, Senior Fellow and Head of the Nuclear and Space Policy Initiative, Observer Research Foundation

12:00 The Outer Space Regime and Global Space Governance

**Mr. Duncan Blake**, Deputy Editor-in-Chief, MILAMOS Project

12:15 Space Situational Awareness

**Ms. Victoria Samson**, Washington Office Director, Secure World Foundation

12:30 Q & A

## **13:00 – 14:45 Lunch Break**

## **14:45 – 15:00 Keynote**

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14:45 Looking Back: 50 Years of the Outer Space Treaty

**Dr. David Kendall**, Chair, United Nations Committee on the Peaceful Uses of Outer Space

## **15:00 – 16:30 Panel 3 – The Outer Space Regime in an Evolving Space Environment**

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*Chair: Ms. Elisabeth Quintana, Senior Research Fellow, The Royal United Services Institute*

15:00 Counterspace Capabilities

**Dr. Xavier Pasco**, Director, Fondation pour la Recherche Stratégique

15:15 Cyber Security of the Space Eco-System

**Dr. Nathan Weiss**, Senior Scientist, Cyber Division, Israel Aerospace Industries

15:30 The Changing Space Security Environment – A Transatlantic View

**Mr. Douglas Loverro**, Former Deputy Assistant Secretary of Defense for Space Policy

15:45 New Space Actors

**Dr. Rogel Mari Sese**, Program Leader of the Philippine Space Development Programme, Department of Science and Technology

16:00 Q & A

## **16:30 – 16:45 Coffee Break**

## **16:45 – 18:00 Panel 4 – Next Generation of Space Activities**

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*Chair: Dr. Olga Volynskaya, Chief International Law Adviser, State Space Corporation “Roscosmos”*

16:45 Active Debris Removal and On-Orbit Satellite Servicing

**Mr. Nobu Okada**, Chief Executive Officer, Astroscale

17:00 Resource Extraction

**Prof. Tanja Masson-Zwaan**, Deputy Director, International Institute of Air and Space Law, Leiden University

17:15 Large Constellations and Small Satellites

**Ms. Joanne Wheeler**, Partner, Bird & Bird

17:30 Q & A

## Friday, 21 April 2017

### 09:30 – 11:00 Panel 5 – Multilateral International Initiatives: Status Update and Ways Forward

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*Chair: Ms. Vivian Loss Sanmartin, Minister Counsellor, Alternate Permanent Representative, Permanent Mission of Brazil to the United Nations, Vienna*

09:30 Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects

**Mr. Li Zhang**, *Second Secretary, Ministry of Foreign Affairs, People's Republic of China*

09:45 International Code of Conduct for Outer Space Activities

**Mr. Bruno Hanses**, *Senior Expert for Disarmament, Non-Proliferation and Arms Export Control, European External Action Service, European Union*

10:00 COPUOS Working Group on the Long-Term Sustainability of Outer Space Activities

**Dr. David Kendall**, *Chair, United Nations Committee on the Peaceful Uses of Outer Space*

10:15 No First Placement of Weapons in Outer Space

**Mr. Andrey Belousov**, *Head of Division, Department of Non-Proliferation and Arms Control, Ministry of Foreign Affairs, Russian Federation*

10:30 Q & A

### 11:00 – 11:15 Coffee Break

### 11:15 – 12:45 Panel 6 – Looking ahead

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*Chair: Mr. Massimo Pellegrino, Researcher, United Nations Institute for Disarmament Research*

11:15 GGE on Space TCBMs: What Next?

**Mr. Hellmut Lagos**, *Chair, Legal Subcommittee, United Nations Committee on the Peaceful Uses of Outer Space*

11:30 Safety, Security and Sustainability of Outer Space Activities: UNOOSA and TCBMs Looking Forward

**Ms. Tanya Keusen**, *Associate Programme Officer, United Nations Office for Outer Space Affairs*

11:45 Secure World Foundation's Handbook for New Actors in Space

**Dr. Michael Simpson**, *Executive Director, Secure World Foundation*

12:00 The Outer Space Treaty and the Future of Space Security Diplomacy

**Ambassador (Ret.) Paul Meyer**, *Senior Fellow, The Simons Foundation Canada*

12:15 Q & A

### 12:45 – 13:00 Closing Session

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12:45 Closing Remarks

**Ambassador (Ret.) Paul Meyer**, *Senior Fellow, The Simons Foundation Canada*

## **Panellists' Biographies**

### **Mr. Andrey BELOUSOV**

Andrey Belousov has been Head of the Multilateral Disarmament Division, Department for Non-Proliferation and Arms Control, of the Ministry of Foreign Affairs of the Russian Federation since 2013.

Mr. Belousov deals with matters pertaining to the prevention of an arms race in outer space, the Biological Weapons Convention, the Convention on Certain Conventional Weapons, and United Nations multilateral disarmament machinery. He regularly participates as an expert in the work of Russian inter-agency delegations at various multilateral disarmament forums, and has been a permanent member of the Russian delegation in the General Assembly First Committee since 2012.

From 2013 to 2015, Mr. Belousov also participated in the open-ended consultations on the draft International Code of Conduct for Outer Space Activities, while from 2012 to 2013 he was a member of the Russian delegation that assisted the Russian governmental expert in the GGE on TCBMs.

Mr. Belousov's prior diplomatic experience includes duties at both the Consulate General of the Russian Federation in San Francisco (2008–2012) and the Embassy of the Russian Federation in Washington, D.C. (2000–2004).

From 2004 to 2008, as well as from 1997 to 2000, Mr. Belousov served on various posts in the Division for Military–Political Issues in Russia–United States Relations of the North America Department, Ministry of Foreign Affairs of the Russian Federation, where he dealt with nuclear disarmament and non-proliferation issues, as well as with strategic stability issues in the Russia–United States relations.

Mr. Belousov holds a Master's Degree in International Relations from the Moscow State Institute for International Relations and a Master's Degree in Civil Law from the Moscow State Law Academy. In 1998, he participated in the IMET Program and completed a training course at the Naval Postgraduate School in Monterrey, California, USA.

### **Ms. Rachita BHANDARI**

Rachita Bhandari joined the Indian Foreign Service in 2005. She is currently serving as First Secretary (Disarmament) at the Permanent Mission of India to the Conference on Disarmament in Geneva.

Prior to this, she has served in the Permanent Mission of India to the United Nations in Geneva (2007–2011) and at the High Commission of India in London (2013–2016). In New Delhi, she has served in the Association of Southeast Asian Nations Multilateral Division of the Ministry of External Affairs (2011–2013).

### **Mr. Duncan BLAKE**

Duncan Blake transferred from the permanent Air Force to the Reserves in January 2017, after 22 years as a Legal Officer in the Royal Australian Air Force. He worked at the tactical, operational, and strategic levels at home and on deployment overseas. He recently returned from the Middle East where he was providing legal support to aerial targeting operations in Iraq and the Syrian Arab Republic. He has worked with strike and fighter jet forces and units responsible for airspace surveillance. He has also been a prosecutor for the military. He served as the Deputy Director of Operations and International Law for the Australian Department of Defence, providing operations and international law advice and support at the highest levels within Defence and across government. More recently, Mr. Blake was legal advisor to the Defence Space Coordinating Office and he chaired inter-departmental and international working groups in respect of strategic space law. His last posting, before transferring out of the permanent Air Force, was in a non-legal position, managing the development of a future joint

operations concept for military use of outer space, to coordinate capability development and force structure decisions in the Australian Defence Force.

He has undergraduate degrees in Law and Economics from the University of Western Australia, a Master of Laws (LLM) degree from the University of Melbourne, and an LLM from McGill University. He is also a graduate of Australian Command and Staff College. His thesis topic for his LLM at McGill University was on the need for a “Manual on International Law Applicable to Military Uses of Outer Space” (MILAMOS). Mr. Blake is currently Deputy Editor-in-Chief for the MILAMOS Project ([www.mcgill.ca/milamos](http://www.mcgill.ca/milamos)), helping to lead a group of international experts to draft such a manual, aiming for publication in 2020.

Mr. Blake has contributed extensively to doctrine and policy for the Australian Department of Defence and government as a whole, on issues of operations law and space law. Although this work is not publicly accessible, he has authored numerous articles, including an article for which he was awarded the 2011 Lieber Society Military Prize by the American Society of International Law.

### **Mr. Bruno HANSES**

Bruno Hanses, a German citizen, is European Union official since 1991 with extensive experience in the Common Foreign and Security Policy.

Mr. Hanses' current position is Senior Expert on Non-Proliferation, Disarmament and Arms Exports Control in the European External Action Service in Brussels.

His previous assignments include, among others, the posts of Head of Political Section in the European Union Delegation in Kinshasa, Democratic Republic of the Congo; Head of Section “Disarmament and Non-Proliferation” in the European Union Delegation in Geneva; and Head of Section “Planning and Operations” in European Union civilian crisis management missions (Georgia, Aceh/Indonesia, Iraq, Kosovo).

### **Dr. David J.W. KENDALL**

David Kendall is the current Chair of the United Nations Committee on the Peaceful Uses of Outer Space for 2016–2017. During his career he has held senior positions with the Canadian Space Agency including as the Director General of Space Science and Technology. He is also a faculty member of the International Space University based in Strasbourg, France.

Born near London, England, Dr. Kendall obtained his doctoral degree in Atmospheric Physics from the University of Calgary. After his PhD he worked in private industry as an R&D scientist and then for the Canadian federal government, first with the National Research Council of Canada and later, with the newly created Canadian Space Agency.

Dr. Kendall is an academican of the International Academy of Astronautics and, during his career, has acted in various capacities on a number of national and international bodies, including the International Space University, the International Astronautical Federation, the Committee on Space Research, COPUOS, the European Space Agency, the Inter-Agency Space Debris Coordination Committee, the Group on Earth Observations, and the Natural Sciences and Engineering Research Council of Canada. He is a member of the Board of Advisors of SEDS Canada and recipient of the CASI 2017 C.D. Howe Award.

In 2002, Dr. Kendall was awarded the Queen Elizabeth II Golden Jubilee Medal in recognition of his significant contributions and achievement to Canada.

**Ms. Tanya KEUSEN**

Tanya Keusen joined the United Nations Secretariat five years ago, through the National Competitive Exam process. During that time she has held positions with the Department of Field Support in New York and the Office for Outer Space Affairs in Vienna. In her current position with the Committee, Policy and Legal Affairs Section of the Office for Outer Space Affairs, she supports the work of the Committee on the Peaceful Uses of Outer Space and its subcommittees. In this connection, she is the Secretary of both the Working Group on the Long-Term Sustainability of Outer Space Activities and the Action Team on Exploration and Innovation.

Prior to joining the United Nations, Ms. Keusen worked for the Government of Canada.

She holds a BA from the University of Victoria and an MA from the University of Essex.

**Mr. Hellmut LAGOS KOLLER**

Hellmut Lagos has been the Chairman of UN COPUOS Legal Subcommittee since 4 April 2016.

He studied Diplomacy at the Diplomatic Academy of Chile, Security and Defence at the National Academy for Political and Strategic Studies, and holds a Master's Degree in International Law and International Relations from the Ortega y Gasset Institute, Madrid.

Mr. Lagos Koller joined the Ministry of Foreign Affairs of Chile in 1995 and has served as Alternate Representative to the Seabed Authority in Kingston, Jamaica (1999–2000), Alternate Representative to the International Organizations in Rome (2001–2004), Alternate Representative to the United Nations, International Atomic Energy Agency and other International Organizations in Vienna, including UNOOSA (2005–2008), Program Director at the Asia-Pacific Economic Cooperation Secretariat in Singapore (2009–2010), Deputy Head for International Security in the Ministry of Foreign Affairs in Santiago (2011–2013), and Deputy Permanent Representative to the United Nations and other International Organizations, including UNOOSA in Vienna (2013–2016).

In 2012 he was appointed by the United Nations General Assembly to the United Nations Governmental Expert Group on Transparency and Confidence Building Measures in Outer Space Activities.

He has been delegate to a large number of international meetings and multilateral forums, including the United Nations First Committee, the International Atomic Energy Agency Board of Governors, the Comprehensive Test Ban Treaty Preparatory Committee, the International Conference on Cluster Munitions, the 2010 Review Conference Preparatory Committee, the Oslo Conference on the Humanitarian Impact of the Use of Nuclear Weapons, the Arms Trade Treaty, and the Biological Weapons Convention, among others.

Mr. Lagos Koller was the head of delegation of Chile in the process of consultations of the International Code of Conduct for Outer Space Activities. He is actively involved in academic activities, and is a regular participant in the Wilton Park Conferences in the United Kingdom and in the Vienna Center for Disarmament and Non-proliferation, among others.

**Mr. Wei LIU**

Wei Liu is a Division Director in the Department of Arms Control of the Ministry of Foreign Affairs of the People's Republic of China.

### **Ms. Vivian LOSS SANMARTIN**

Vivian Loss Sanmartin has been a career diplomat since 1994.

She has served in several diplomatic posts abroad, among which the Brazilian Permanent Delegation to the European Union in Brussels and the Brazilian Embassy in Buenos Aires, where she was the head of the energy section.

Since 2012, she has been the Minister Counsellor at the Brazilian Embassy in Vienna, as well as the Alternate Permanent Representative of the Brazilian Mission to the International Organizations in Vienna. She has regularly been heading the Brazilian delegations to COPUOS and its subsidiary bodies' meetings, and has participated in the negotiations of the Working Group on the Long-Term Sustainability of Outer Space Activities.

### **Mr. Douglas L. LOVERRO**

Douglas Loverro is a recognized and highly sought-after expert in defence and intelligence space matters, having worked for over 30 years in the United States Department of Defense and the National Reconnaissance Office developing, managing, and establishing national policy for the full range of national security space activities.

For the last four years, he served as the Deputy Assistant Secretary of Defense for Space Policy. In this role, he was responsible for establishing policy and guidance to assure United States and allied warfighters the benefits of space capabilities and to help guide the Department's strategy for addressing space-related issues. He led Departmental activities in international space cooperation, assessment of the national security impacts of commercial space activities, and oversaw the establishment of a strategy for addressing growing challenges in space security.

From 2007 to 2013, Mr. Loverro served as the Executive Director and Deputy Program Executive Officer for the Air Force Space Command's Space and Missile Systems Center. In that capacity, he was responsible for the development, deployment, and sustainment of all Department of Air Force space systems and was a key spokesman for addressing the growing importance of space systems and the steps needed to assure them for the future. Prior to his assignment at the Center, he served in a wide range of space leadership roles as Deputy Director of System Engineering at the National Reconnaissance Office, and Program Director for the Future Imagery Architecture System, the US Global Positioning Satellite System, and the Air Force's classified space control systems programme.

Mr. Loverro is credited with a wide-ranging list of accomplishments in aerospace development including the development of a national strategy for space defense and space system resilience, initiating modernization of the third-generation GPS System, establishing the Department of Defense's Global Broadcast Service programme, and the invention of the supersonic chemical oxygen-iodine laser. He is an outspoken advocate for greater use of commercial capabilities and manufacturing for future Department of Defense space and launch missions. He retired from active duty in the Air Force as a Colonel in February 2006 after 30 years of uniformed service and upon selection as a member of the Defense Intelligence Senior Executive Service.

Mr. Loverro holds an MS in Physics from the University of New Mexico, an MS in Political Science from Auburn University, an MBA from the University of West Florida, and a BS in Chemistry from the United States Air Force Academy. He was the top graduate from his class at the Industrial College of the Armed Forces and is a graduate of the JFK School of Government Senior Executives in National and International Security Program, and the National Defense University's Pinnacle Program.

Mr. Loverro is married to Stephanie Loverro and they have two children, Adam and Kari. He is an avid triathlete and is in competition with his daughter, who is winning.

### **Prof. Tanja MASSON-ZWAAN**

Tanja Masson-Zwaan is Assistant Professor and Deputy Director of the International Institute of Air and Space Law at Leiden University.

From 2007 to 2016, she was the elected President of the International Institute of Space Law. In 2016 she was elected President Emerita.

Tanja advises various bodies on space law issues, teaches and supervises students at Bachelors, Masters, and PhD level, carries out research, and publishes on a broad range of space law topics.

She is an elected member of various professional associations, such as the International Academy of Astronautics and the International Law Association, and serves as advisor to several organizations including Secure World Foundation and Mars One. She also was a Member of the Founding Board of Women in Aerospace–Europe.

### **Ambassador (Ret.) Paul MEYER**

Paul Meyer is a Senior Fellow at The Simons Foundation Canada and an Adjunct Professor of International Studies at Simon Fraser University, both in Vancouver, Canada.

A former Canadian career diplomat, he served over 35 years in a variety of assignments, primarily in the field of international security policy. Among these he was Director-General of the International Security Bureau (1998–2001), Ambassador and Permanent Representative to the United Nations and Conference on Disarmament in Geneva (2003–2007), and Director-General of the Security & Intelligence Bureau, Department of Foreign Affairs and International Trade (2007–2010).

He is a member of the Governance Group of the Space Security Index, an annual publication that surveys developments in outer space with implications for security, and his research and writing interests include, besides space security, the nuclear non-proliferation and disarmament regime and international cybersecurity.

### **Mr. Nobu OKADA**

Nobu Okada founded ASTROSCALE PTE. LTD. in Singapore in 2013 due to a strong desire to address the growing threat of space debris. He used his personal funds as seed money and hired a team in Singapore and Tokyo while raising capital for the business. The team calls themselves “Space Sweepers”, and their mission is to secure space flight safety by incubating space debris removal technologies.

Mr. Okada serves as a member of the Subcommittee on Space Civil Use and Space Industry at the Cabinet Office for the Government of Japan, and is also a member of The Future of Space Technologies Council, World Economic Forum, and International Astronautical Federation.

Prior to ASTROSCALE, Mr. Okada was a Japanese IT entrepreneur and strategy consultant, and had managed IT companies in Japan, China, India, and Singapore. He led one company to a successful IPO. Before joining the IT industry, he worked for McKinsey & Company, and the Japanese Government in the Ministry of Finance.

Mr. Okada earned his Bachelor’s Degree in Genetics from the University of Tokyo in 1995 and an MBA from the Krannert School of Business, Purdue University, in 2001. When he was a teenager, Mr. Okada attended a camp at NASA’s Marshall Space Flight Center in the United States where he met Japan’s first astronaut, Mr. Mamoru Mohri. He received the handwritten message, “Space is where you will thrive.”, and he has been inspired to work on space ever since.

## **Dr. Xavier PASCO**

Xavier Pasco (Doctor in Political Science, University of Paris-Sorbonne) is Director of the *Fondation pour la Recherche Stratégique*, an independent think tank based in Paris.

Before that, Dr. Pasco was Senior Research Fellow in charge of the programme “Space, High Technology and Security”. Previous to 1997, he was researcher at CREST (Center for Research and Evaluation of the relationships between Strategies and Technology) associated to the Ecole Polytechnique, France, where he started his career in 1988.

Dr. Pasco has conducted and been involved in a number of projects investigating the use of space for security, notably in support of the French Ministry of Defence but also in relation to the European Union R&D Framework Programme (coordinated by the European Commission), as well as of other international organizations. He has also been part of numerous working groups related to national and European space policy.

In the European domain, Dr. Pasco has supported several analytical works of the Subcommittee on Security and Defence of the European Parliament, and contributed to European Defence Agency and European Space Agency on-going work on governance and data-policy issues for future programmes. In particular, he has been in charge of the ESA-commissioned study related to governance and data policy models suitable for a European Space Situational Awareness System. He has also been in charge of a European Union-mandated study about the governance and data policies related to the development of the ground segment of the future European military observation systems. In his capacity as policy external adviser for the Joint Space Command and the General Direction of the International Relations and Strategy of the French Ministry of Defence, Dr. Pasco has recently been focusing on the legal and policy issues related to the development of an international security framework for the use of space systems with a view to promoting TCBMs and to mitigating risks and threats in space. He has also worked on the legal and policy aspects of electromagnetic interference-related issues in collaboration with key commercial telecommunication satellite operators.

Dr. Pasco is also an associate Research Fellow at the Space Policy Institute in the George Washington University (Washington D.C.). He has also been giving lectures in the French Military School in Paris as well as at the Institute of Political Studies in Paris. He is the Deputy Editor of the international academic review *Space Policy*. He has also been named Expert at the European Economic and Social Committee in Brussels in 2007. In 2012, Xavier Pasco has been elected full member of the International Academy of Astronautics.

He has published numerous works (books, more than 100 articles or papers) on space and security topics.

## **Mr. Massimo PELLEGRINO**

Massimo Pellegrino is the researcher and point of contact on space security matters at UNIDIR. His research mainly focuses on the relationships between outer space security, strategic stability, and arms control.

Prior to joining UNIDIR, Mr. Pellegrino worked as policy analyst and project manager at the European Union Institute for Security Studies, where he both coordinated the Institute’s research efforts in the field of space and security, and led an inter-institutional task force with a view to informing European Union policymaking in this domain.

From 2009 to 2014, he worked in different capacities at the European Space Agency, European GNSS Agency, European Commission, Italian Ministry of Foreign Affairs, and in industry.

Mr. Pellegrino has been a speaker and moderator at several conferences and workshops on space and security issues, notably at the International Astronautical Congress, European Interparliamentary Space Conference, European External Action Service, European Union Institute for Security Studies,

European Space Agency, and Chatham House. He was also a delegate at the fifty-third session of the Scientific and Technical Subcommittee of COPUOS.

Mr. Pellegrino has been a member of the American Institute of Aeronautics and Astronautics, the Institute of Electrical and Electronics Engineers, and other professional associations committed to advancing technological innovation and excellence.

Mr. Pellegrino received a Master's Degree in Space Studies from the International Space University, as well as a Master's Degree in Economics, and a Master's and a Bachelor's Degree in Industrial Engineering from the University of Naples Federico II.

### **Ms. Elizabeth QUINTANA**

Elizabeth Quintana is a Senior Research Fellow, Futures and Technology, at the Royal United Services Institute, looking at the doctrinal, strategic, and ethical implications of emerging technologies and how they will impact on defence and security and indeed wider society.

She has a particular interest in the emergence of space as a domain and "New Space" actors; in the use of unmanned technology and robotics; 3D and 4D printing, and in the use of artificial intelligence and analytics. These interests feed into broader research themes of governance and security in the age of social media; the social and security implications of truly global interconnectivity; and work, stability, and security in volatile world. She is responsible for conducting research, writing articles, and organizing events related to these topics.

Elizabeth has held a variety of posts while at RUSI most latterly running the Military Sciences team. Prior to that she was Senior Research Fellow for Air Power & Technology, Programme Head, Acquisition and Programme Head C4ISR. Ms. Quintana retains a strong interest in international defence matters and how trends in the security sector intersect with or affect broader social trends.

Before joining RUSI, Ms. Quintana worked for two years running technical conferences for the international defence community. In 2001 she took a graduate assistant position at the University of Texas A&M where she worked for two years on a DARPA project investigating collaborative robotics.

Elizabeth holds an MEng in Automatic Control and Systems Engineering from the University of Sheffield and an MSc in Aerospace Engineering from the University of Texas A&M.

### **Dr. Rajeswari Pillai RAJAGOPALAN**

Rajeswari Pillai Rajagopalan is Senior Fellow and Head of the Nuclear and Space Policy Initiative at the Observer Research Foundation, New Delhi.

Dr. Rajagopalan joined the Foundation after a five-year stint at the National Security Council Secretariat (2003–2007), where she was an Assistant Director. Prior to that, she was Research Officer at the Institute of Defence Studies and Analyses, New Delhi.

She is the author of five books: *Locating India within the Global Non-Proliferation Architecture: Prospects, Challenges and Opportunities* (2016); *Nuclear Security in India* (2015); *Clashing Titans: Military Strategy and Insecurity Among Asian Great Powers* (2012); and *The Dragon's Fire: Chinese Military Strategy and Its Implications for Asia* (2009). She has also co-authored and edited five other books, including *Space India 2.0: Commerce, Policy, Security and Governance Perspectives* (2017).

Her research articles have appeared in edited volumes and in peer-reviewed journals, such as *India Review*, *Strategic Studies Quarterly*, *Air and Space Power Journal*, *International Journal of Nuclear Law*, *Strategic Analysis*, and *CLAWS Journal*.

She has also been invited to speak at international forums including COPUOS, the CD, UNIDIR, the Association of Southeast Asian Nations Regional Forum, and the European Union.

### **Ms. Victoria SAMSON**

Victoria Samson is the Washington Office Director for Secure World Foundation and has nearly 20 years of experience in military space and security issues.

Before joining Secure World Foundation, Ms. Samson served as a Senior Analyst for the Center for Defense Information, where she leveraged her expertise in missile defence, nuclear reductions, and space security issues to conduct in-depth analysis and media commentary. Prior to her time there, Ms. Samson was the Senior Policy Associate at the Coalition to Reduce Nuclear Dangers, a consortium of arms control groups in the Washington, D.C. area, where she worked with Congressional staffers, members of the media, embassy officials, citizens, and think tanks on issues surrounding dealing with national missile defence and nuclear weapons reductions. Before that, she was a researcher at Riverside Research Institute, where she worked on war-gaming scenarios for the Missile Defense Agency's Directorate of Intelligence.

Known throughout the space and security arena as a thought leader on policy and budgetary issues, Ms. Samson is often interviewed by multinational media outlets, including the New York Times, Space News, and NPR. She is also a prolific author of numerous op-eds, analytical pieces, journal articles, and updates on missile defence and space security matters.

Ms. Samson holds a BA degree in political science with a specialization in international relations from UCLA and an MA in international relations from the Johns Hopkins School of Advanced International Studies.

### **Mr. Jarmo SAREVA**

Jarmo Sareva of Finland was appointed as Director of UNIDIR effective 1 January 2015.

Mr. Sareva brings to the Institute a wealth of experience from United Nations and disarmament affairs. Until the end of 2014 he served as Deputy Secretary-General of the Conference on Disarmament and Director of the Conference on Disarmament Secretariat and Conference Support Branch (Geneva Branch) of the United Nations Office for Disarmament Affairs, which post he had held since September 2009.

From 2006 to 2009, Mr. Sareva served as Chief of the Disarmament and Peace Affairs Branch at the Department for General Assembly and Conference Management of the United Nations Secretariat in New York, and as Secretary of the First Committee (Disarmament and International Security) of the General Assembly. Prior to that, Mr. Sareva was Ambassador and Deputy Permanent Representative of Finland to the United Nations in New York, during which time he served, inter alia, as Chairman of the First Committee. Mr. Sareva served as Special Assistant to the Executive Chairman of the United Nations Monitoring, Verification and Inspection Commission (UNMOVIC), a subsidiary organ of the Security Council, from 2001 to 2002.

From 2000 to 2001, Mr. Sareva was Chef de Cabinet of the Office of the President of the fifty-fifth session of the General Assembly (Millennium Assembly). During that time, he guided the work of the Cabinet during a record number of major conferences and special sessions of the General Assembly, including the Conference on the Illicit Trade in Small Arms and Light Weapons. The Presidency was widely appreciated for successfully integrating the various United Nations conferences during that year under the general theme of follow-up to the September 2000 Millennium Summit.

From 1998 to 2000, Mr. Sareva served as Minister Counsellor at the Permanent Mission of Finland to the United Nations in New York. He represented the European Union in the Fifth Committee during the Finnish Presidency of the European Union (1999), acting as chief negotiator for the European Union during the budget negotiations for the 2000–2001 biennium.

Mr. Sareva's prior diplomatic experience includes two tours of duty at the Embassy of Finland in Moscow, including as Deputy Chief of Mission from 1996 to 1998. He has also served as Director of Disarmament, Arms Control and Non-Proliferation at the Ministry for Foreign Affairs in Helsinki, as First

Secretary at the Finnish Embassy in Washington, D.C., and as Counsellor at the Finnish Mission to the Conference (now Organization) on Security and Cooperation in Europe in Vienna.

Mr. Sareva holds an MA from the School of Advanced International Studies of the Johns Hopkins University in Washington, D.C., and an MSc (Political science) from the University of Turku in Finland. From 1989 to 1990, he spent an academic year in postgraduate training on leave from Ministry of Foreign Affairs at the Graduate Institute of International Studies in Geneva.

#### **Dr. Rogel Mari SESE**

Rogel Mari Sese was the program leader of the National Space Development Program under the Philippine Council for Industry, Energy, and Emerging Technology Research and Development of the Department of Science and Technology.

He is the foremost space expert in the Philippines and key person in developing the Philippine space programme. He was instrumental in the filing of House Bills and Senate Bills pushing for the legislation of the Philippine Space Development and Utilization Policy and creation of the Philippine Space Agency.

He also serves as the focal person for the Philippine Space Science Education Program of the Science Education Institute of the Department of Science and Technology, as well as numerous international space collaborations and organizations.

#### **Dr. Michael K. SIMPSON**

Michael Simpson is Executive Director of the Secure World Foundation and former President of the International Space University.

Dr. Simpson's academic career extends over 36 years and five continents. In addition to his tenure at International Space University, he has been President of Utica College and the American University of Paris with a combined total of 22 years of experience as an academic chief executive officer.

He currently holds a post as Professor of Space Policy and International Law at the International Space University. He is a member of the International Academy of Astronautics, a member of the International Institute of Space Law, and a Senior Fellow of the International Institute of Space Commerce.

His practical experience includes service as an observer representative to both COPUOS and the Group on Earth Observations, and a member of both the Executive Committee and Board of Directors of the World Space Week Association, and the Board of Governors of the National Space Society in the United States. He is a founding Trustee of Singularity University and chairs the "Ten-to-the-Ninth Plus" Foundation.

#### **Dr. Olga VOLYNSKAYA**

Olga Volynskaya is Chief International Law Counsel of ROSCOSMOS and Research Scientist of the Russian Foreign Trade Academy.

She holds an LLM in European Union Law and a PhD in Space Law, and is permanent member of the Russian delegation to COPUOS, and its Scientific, and Technical and Legal Subcommittees.

Dr. Volynskaya is also a visiting professor of the People's Friendship University of Russia and Moscow State Institute of International Relations.

She is author of a study course on "Fundamentals of International Space Law" at the People's Friendship University of Russia, and co-author of a specialized course on "European and Eurasian Space Law" at the Moscow State Institute of International Relations. She has authored 32 scientific

publications in leading Russian and foreign journals on international law and foreign trade, and co-authored eight books on space law, inter alia the Russian textbook “International Space Law”, edited by G.P. Zhukov. She is also a member of the Tsiolkovsky Russian Academy of Cosmonautics and the International Institute of Space Law.

#### **Dr. Nathan WEISS**

Nathan Weiss received his BSc in Mathematics and Physics from the University of Toronto and his PhD in Physics from McGill University.

Following post-doctoral positions at the Stanford Linear Accelerator Center and the University of Illinois at Urbana-Champaign, Dr. Weiss joined the faculty of the Department of Physics and Astronomy at the University of British Columbia in Vancouver, Canada, where he pursued an active academic research and teaching career.

In 2001, Dr. Weiss joined Israel Aerospace Industries where he has led several high-profile R&D programmes including Israel Aerospace Industries’ participation in both an Israeli and a European R&D consortium in the field of aviation security.

Dr. Weiss is currently a Senior Scientist in the Cyber Division at Israel Aerospace Industries. His activities include Advanced Cyber Defence for Aviation and Space Systems, and he is a leader in Israel Aerospace Industries’ participation in a Horizon 2020 consortium on Social Engineering in Cyber Security.

#### **Ms. Joanne WHEELER, MBE**

Joanne Wheeler is a partner in Bird & Bird's Tech and Comms Group, in London. She specializes in communications, satellite, and space regulatory and policy matters together with commercial contracts and public-private partnerships. She is one of the leading practitioners in the field of satellites, having worked at both the European Space Agency and Ofcom, giving her an unparalleled understanding of the challenges facing the sector.

In January 2017, Joanne was awarded an MBE for her services to the space industry. She was named in the 2013 “Hot 100 Lawyers” for her work with the United Kingdom industry and Government’s Innovation and Growth Strategy and for setting up the Satellite Finance Network, which she continues to co-chair and run. She won the individual Financial Times European Legal Innovator of the Year Award in 2014, and was short-listed for lawyer of the year in 2017.

She is an elected Fellow of the Royal Astronomical Society and a member of the International Institute of Space Law.

#### **Mr. Li ZHANG**

Li Zhang is a Second Secretary of the Ministry of Foreign Affairs of China. His work focuses on outer space security. He holds a Master’s degree of International Law from the China Foreign Affairs University.





## **UNIDIR Space Security Conference 2017**

### **Celebrating the Outer Space Treaty: 50 Years of Space Governance and Stability**

**Conference Report**  
20–21 April 2017

The year 2017 marks the fiftieth anniversary of the entry into force of the Outer Space Treaty. Since then, space activities have increased both in number and importance. While continuing to support military operations, space systems have become an indispensable tool for an expanding range of activities, and an invaluable source of socio-economic benefits for billions of people on Earth. However, the strategic value of outer space is threatened as space systems are subject to numerous threats and hazards, ranging from anti-satellite weapons and cyber attacks, to space debris and signal jamming. Irresponsible behaviour in space operations also contributes to undermining confidence and trust among space actors. The international community has been engaged in multiple activities to enhance international stability and ensure that space operations can be safe, secure and sustainable over the long term. These include multilateral initiatives, primarily within the United Nations, to promote and build multilateral consensus on norms of behaviour. Nonetheless, progress has been intermittent and further work is required.

UNIDIR's 2017 Space Security Conference reviewed the main multilateral international initiatives to safeguard access to, and use of, outer space and assess the adequacy of the outer space regime in an evolving space environment, where new threats to space systems and developments in space activities are believed to be potentially destabilizing. The Conference, organized at a time when situational awareness, preparedness, resilience and strategic autonomy have become critical factors for all our public policies, represents a much-needed complement to shaping more incisive security policies.