



UNIDIR

UNIDIR Space Security Conference 2016

**Sustaining the Momentum:
the Current Status
of Space Security**

UNIDIR RESOURCES

Acknowledgements

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This report was drafted by Daniel Golston.

About the organizers

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

Secure World Foundation (SWF) is a private operating foundation dedicated to the secure and sustainable use of space for the benefit of Earth and all its peoples. SWF 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 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 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 has been a supporter of the UNIDIR Space Security Conference series since its inception as well as the principal NGO contributor to *Space Security Index*, an annual publication surveying developments in the use of outer space relevant to its security and sustainability.

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UNIDIR Space Security Conference 2016

Sustaining the Momentum: the Current Status of Space Security

Conference Report
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Introduction

States and modern societies rely heavily on the space domain. Space-based assets and technologies contribute greatly to a range of human activities, from agriculture management to global logistics, financial markets, environmental resource management, weather monitoring and military operations. However, in the near and long term, humanity's access to space is in no way a given. The international community faces a range of pre-existing and emerging challenges, from satellite interference (both intentional and unintentional) to the accumulation of space debris, orbital congestion, a proliferation of new space actors as well as increased militarization and the potential weaponization of space. As these issues continue to grow and morph in the highly dynamic space domain, it is important to facilitate dialogue on Earth to build capacity and trust between all space stakeholders so that we all may continue to reap the benefits of this global common.

In the past year, momentum has built around multilateral space security efforts in a variety of international forums and capitals around the world. In October 2015, the international community held its first ad hoc meeting of the seventieth session of the United Nations General Assembly (UNGA) First and Fourth Committees on 'Possible Challenges to Space Security and Sustainability' (henceforth the seventieth UNGA First and Fourth Committee Meeting on Space). The event represented a major step towards a holistic and multifaceted approach to space security. While its realization is commendable, the meeting also exposed both new and long-standing schisms between space stakeholders and reinforced the importance of continued dialogue. There has also been movement on a series of proposed space-related initiatives, including the draft Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects (PPWT), the No First Placement of Arms in Outer Space (NFP) initiative and related resolutions, and

the International Code of Conduct for Outer Space Activities (ICOC) process proposed by the European Union (EU). Important work has been undertaken within the UNGA, the United Nations Office for Disarmament Affairs (UNODA), the International Telecommunications Union (ITU), and the United Nations Office for Outer Space Affairs (UNOOSA), including its Committee on the Peaceful Uses of Outer Space (COPUOS). Furthermore, various States have continued to implement the transparency and confidence-building measures (TCBMs) recommended by the 2013 United Nations Group of Governmental Experts (GGE) on TCBMs in Outer Space Activities (henceforth 2013 UN GGE on space TCBMs).

These developments affirm that the future direction of efforts to secure humanity's access to a stable space domain is one of international cooperation and collaboration. Moving forward, it is essential to build on this momentum and sustain it for the future.

The role of the Conference

For 15 years, UNIDIR's Space Security Conference Series has convened a wide range of stakeholders and actors in the space domain. This year's iteration, entitled 'Sustaining the Momentum: the Current Status of Space Security', sought to facilitate dialogue on foundational concepts, provide overviews and updates from a series of space actors and regulatory bodies, examine the key political and legal initiatives currently under consideration by the international community, and discuss the best way forward in terms of a multilateral space security regime.

PROCEEDINGS¹

- **Welcome from UNIDIR**

Jarmo Sareva, Director, United Nations Institute for Disarmament Research

- **Opening remarks**

Michael Simpson, Executive Director, Secure World Foundation

UNIDIR's Director, Mr Sareva, opened the conference by referring to the current momentum in the multilateral space security regime. In 2015, this momentum was sustained by the seventieth UNGA First and Fourth Committee Meeting on Space and the consensus adoption of the United Nations First Committee resolution on TCBMs in space. During the next two days, Mr Sareva explained, the conference would focus on the current status of processes that are critical to sustaining this momentum and maintaining space as a peaceful domain.

He continued by affirming that a safe, secure and sustainable space environment is essential to our way of life. The security of space-based assets is critical to a broad range of human activities, from monitoring human rights abuses to locating fresh water resources and the functioning of global financial markets. Mr Sareva explained that UNIDIR sees a connection not only between space security and international peace and security, but with human security as well. UNIDIR places great emphasis on linking its work with the global and humanitarian issues and priorities set by States such as the United Nations post-2015 Development Agenda and, more specifically, the Sustainable Development Goals.

¹ This report aims solely to reflect the content of the presentations and discussions and does not necessarily reflect the opinions and positions of UNIDIR, the United Nations, the sponsoring organizations, or of supporting States.

This year is the fifteenth iteration of UNIDIR's Space Security Conference Series. Themes have changed throughout the years. However, irrespective of title and focus, Mr Sareva regarded the conference as a valuable track 1.5 forum for government and non-governmental stakeholders to exchange views on important current issues.

Over the years, UNIDIR has helped build capacity for and between established and emerging space-faring actors, contributing to security both in space and on Earth. In 2015, UNIDIR's work on space security included supporting and participating in the third Association of Southeast Asian Nations Regional Forum Workshop on Space Security in Beijing, China. This workshop affirmed the continued need to support United Nations Member States in clarifying national positions and policies regarding space activities, understanding regional space equities and building capacity on international peace- and security-related space matters.

In support of this, UNIDIR convened this year's Space Security Conference under the title 'Sustaining the Momentum: the Current Status of Space Security'. Mr Sareva said that 2015 had been an important year for multilateral space security and that, moving forward, it was vital to sustain this momentum. Concluding his speech, he reminded participants that space is a truly globalized domain with profound national security implications, and therefore that continued dialogue and cooperation in forums such as this one is extremely important.

In his opening remarks, Mr Simpson explored the notion of momentum in space security processes. He asked participants to reflect not only on the momentum they hope to sustain but also the momentum already built into the work they do. When COPUOS was founded, it had 11 members. Now, its membership is fast approaching 90. In November 2015, the Group on Earth Observation welcomed its 100th member – over half of the UNGA is now represented. Looking back on the 60 years of the space age, Mr Simpson explained that the international community has achieved what no one thought possible. He asked that participants keep this in mind as they reflected on the difficulties currently faced in the space domain. What these substantial membership figures tell us, Mr Simpson continued, is that the work we are doing on space security is now seen as a critical part of the investment of over 100 States. This, he asserted, is momentum.

At the seventieth UNGA First and Fourth Committee Meeting on Space, Mr Simpson saw the sharing of common values and exchange of a common vocabulary among States; all of which affirmed that the international community wants the space domain to be more secure. Reflecting on the 2013 UN GGE on space TCBMs consensus report, Mr Simpson said that there had been clear progress regarding TCBMs in space, something many cynics never thought was possible. He recognized that the 2013 output was not a groundbreaking report in its content, but nevertheless it showed that established and emerging space-faring nations could reach consensus and collectively move forward. This, too, counted as momentum. He concluded his remarks with a message to all participants: in the description of problems are the seeds of solutions which in turn can germinate. All that is being asked of participants, and the States they represent, is to continue a long tradition of perseverance and progress which is deeply rooted in the way space-faring nations have dealt with one another for the last 60 years.

Panel 1 National Perspectives

- **Russian Federation**

Vladimir Yermakov, Deputy Director-General, Department for Non-proliferation and Arms Control, Ministry of Foreign Affairs, Russian Federation

- **People's Republic of China**

Ambassador FU Cong, Deputy Permanent Representative (Disarmament), Permanent Mission of the People's Republic of China to the United Nations, Geneva

- **United States of America**

Christopher Buck, Deputy Permanent Representative to the Conference on Disarmament, Permanent Mission of the United States of America, Geneva

- **India**

Ambassador Venkatesh Varma, Permanent Representative, Permanent Mission of India to the Conference on Disarmament, Geneva

- **Mexico**

Ambassador Jorge Lomónaco, Permanent Representative, Permanent Mission of Mexico, Geneva

The first panel provided an opportunity for some established space-faring nations to express national perspectives and positions on aspects of the current multilateral space security regime. Mr Yermakov began by affirming the Russian Federation's support for UNIDIR and its activities, both of which help bring States together to discuss issues of arms control, strategic stability and international security. Next, he asked a fundamental question: how long will we be able to maintain an outer space free from weapons and the use of force? The answer to this critical question depends on the international community and its collective efforts regarding the Conference on Disarmament (CD) agenda item on the prevention of an arms race in outer space, the proposed draft PPWT and the NFP initiative. He explained that the possibility of weapons in space would be a 'game changer' for international security and in the light of this fact, the international community is in need of legally binding rules. Mr Yermakov called for clear, acceptable-to-all principles of equal cooperation with full respect for the interests and fundamental principles of equal and indivisible security for all nations.

As space-faring nations become ever more technologically sophisticated and active in space, Mr Yermakov urged them to remember that operating in space also comes with specific responsibilities. Therefore, it is extremely important for all space-faring nations to do their best to prevent the placement of weapons in space and to prevent any use of force against space-based assets. In this respect, Mr Yermakov saw the Russian draft NFP-related resolution, the 2014 version of which had 33 co-sponsoring States, as a valuable contribution. He concluded his presentation by explaining that the NFP initiative addresses a simple yet important question which must be answered before any other space security matter can be discussed: should the international community allow weapons in space or not?

In his presentation, Ambassador Fu echoed Mr Yermakov as he reiterated the importance of UNIDIR and this annual conference to discussions on space security. Outer space, according to Ambassador Fu, is currently confronted with a series of growing challenges in terms of its security and development. As such, the importance of space security efforts cannot be overemphasized. Focusing on China's expectations for multilateral space security processes, Ambassador Fu said that it was important to address major threats such as space debris and orbital congestion. However, the ultimate threat comes from the weaponization of space. If one day weapons are introduced into space, it may erode mutual confidence between States. In a situation such as this, the Ambassador warned that an arms race in space may be unavoidable.

A multilateral space security process should enjoy the widest possible support from States and in this respect, PAROS has the most obvious advantage as demonstrated by the UNGA adopting the relevant resolution ("Prevention of an arms race in outer space") by an overwhelming majority for over 30 years. Furthermore, Ambassador Fu noted that space security is as much an issue of development as one of security. Therefore, any multilateral process should uphold the common development interests of all States. Space is a shared asset for all humanity and thus all should enjoy its benefits. Ambassador Fu continued that a workable space security regime should be conducive to international cooperation while taking into account capability gaps between States, meaning that the international community should aid States in the development of their space capabilities.

Ambassador Fu reminded participants that the draft PPWT proposed by China and the Russian Federation conforms to the majority-held view that an imminent task for space security is to limit an arms race in space. He explained that the draft had been carefully crafted on the basis of 20 years of discussions within the CD, and, in the spirit of openness and transparency, had undergone several rounds of alterations after discussions with other States. Ambassador Fu stated that the current draft PPWT reflects the maximum degree of consensus on space security rule-making, and that China was looking forward to deepening discussion on the draft in the future.

The next presenter, Mr Buck, provided some comments on diplomatic efforts by the United States and observations on the space domain. His presentation centred on one aspect of efforts by the United States: implementing international TCBMs in order to promote safe and responsible space activities. This builds on the goals of US space policy over the past 50 years. The United States has noted the substantial changes in the space security environment, many of which threaten to hinder global access. Notably, issues of space debris and irresponsible activities by State actors add difficulty and complexity to space security efforts.

Regarding the position of the United States on the latest draft PPWT, Mr Buck noted that his government will soon be formally responding. In the meantime, the United States reiterated its view that the 2014 draft PPWT is fundamentally flawed. The scope of the proposal, absence of working definitions, lack of verification mechanisms and failure to address terrestrial-based anti-satellite weapons were all issues for the United States. Regarding other efforts to enhance security in space, Mr Buck explained that the United States is committed to implementing norms of behaviour from the 2013 UN GGE on space TCBMs report and that, along with member States of the Group of 7, the United States will continue to support other States to do the same. Furthermore, at an upcoming session of the CD, the United States plans to share its views on space TCBMs and will submit comments expanding on the implementation by the United States of various TCBMs, which can help clarify the

intent of national space policy and avoid future misunderstandings. Mr Buck listed some examples of TCBMs implemented by the United States, including publishing information regarding national space policy and government expenditures, holding extensive bilateral and multilateral discussions with other States, conducting information exchanges regarding orbital space objectives,² and welcoming international observers to the National Aeronautics and Space Administration and other space-related facilities.

Mr Buck then turned his attention to space matters within the United Nations system. The United States welcomed efforts to improve coordination on TBCMs within the United Nations system and appreciated the increased engagement of UNODA. Recognizing that a secure space domain is vital to the daily lives of global citizens and a functioning economy, Mr Buck urged other nations to implement the recommendations of the report of the 2013 UN GGE on space TCBMs and welcomed future discussions on these issues.

The following panellist, Ambassador Varma, provided a summary of India's activity in the space domain. India is a major space-faring nation that cooperates with over 36 States on space matters and maintains a highly successful and cost-effective space launch programme. The Ambassador explained that India is against the weaponization of space and supports efforts to reinforce the security of space-based assets. In this regard, universal TCBMs are useful but not a viable substitute for international legal frameworks which need to be strengthened. Ambassador Varma explained that India is prepared to consider the draft PPWT as a contribution to the various existing proposals regarding space security, though he acknowledged the important gaps in the draft treaty and the need for further discussion on some of its components. On the NFP initiative, Ambassador Varma saw this as an interim step in the prevention of the placement of weapons in space. As regards India's activities on space security, Ambassador Varma noted his government's active participation in COPUOS and the seventieth UNGA First and Fourth Committee Meeting on Space, its numerous international cooperation activities as well as India's voluntary implementation of TCBMs including registering space objects with the United Nations. He also noted concerns that the composition of the GGE might have affected the scope of the GGE's recommendations.

Ambassador Varma concluded his presentation by reiterating a common theme of the conference: space is and should remain a global common for all humankind.

The final panellist, Ambassador Lomónaco, described Mexico's activity and role in the space domain. Mexico has been an active space-faring nation almost from the beginning of space exploration. Over the years, Mexico has launched a total of 12 satellites, seven of which are active today. As regards multilateral cooperation, Mexico is a founding member of UNOOSA, participates extensively in the ICOC process, conforms to relevant guidelines issued by international organizations, and is one of the few States that have ratified all five space treaties.

The second half of Ambassador Lomónaco's presentation explored his government's perspective on the way forward for multilateral space security processes. Compared to other established space-faring nations, the Ambassador noted that Mexico plays a relatively minor role in space. Nevertheless, Mexico has displayed a strong commitment to working multilaterally for a safe and secure space domain. In short, Mexico believes that the international community should preserve the space environment as a common heritage for all humanity, prevent its militarization and foster peaceful, and only peaceful, uses of outer space.

² For more information, see www.space-track.org.

In this context, Ambassador Lomónaco suggested the need to make progress on norms of behaviour and eventually move towards legally binding instruments. He expressed concern over any efforts which may lead to legitimizing the use of space as a theatre of conflict under a doctrine of self-defence. Furthermore, his government is firmly against the deployment of any weapons, particularly weapons of mass destruction, in space and supports the negotiation of an instrument for the prevention of an arms race in space. Regarding the NFP initiative, the Ambassador expressed serious concerns over its approach. He took particular issue with the subject of weapons of mass destruction use (not solely 'first' use, but use in general) in space and elsewhere. He explained that Mexico believes the approach of the NFP initiative could and would lead to legitimizing and legalizing the right to respond or the right to use such weapons, which Mexico firmly rejects. As a solution, he suggested that the NFP initiative morph into a 'No Placement' resolution whereby the 'First' is removed. Ambassador Lomónaco lamented the 20-year long paralysis of the CD and felt that pursuing this subject in the UNGA may add a universality factor which, in his opinion, should underlie and drive anything to do with common heritage such as the space domain.

The discussion that took place after Panel 1 examined subjects raised in the preceding presentations. Participants enquired about the status and future of the politically binding ICOC and the legally binding PPWT. Regarding the former, some participants expressed reservations over the ICOC's position on self-defence as well as the political process of the code itself. Others felt that space security measures should come in the form of legally binding instruments, which may give States the incentive to cooperate with one another. On the PPWT, some participants felt that the draft treaty was not yet mature enough for negotiation as various issues, specifically those regarding viable verification mechanisms and key definitions, were yet to be resolved. Another participant acknowledged that while these concerns are legitimate, they could be explored during negotiations in depth.

Panel 2 Foundational Concepts

- **Space Debris**

Richard Crowther, Chief Engineer, United Kingdom Space Agency

- **Interests of New Actors**

Teresita Alvarez, Permanent Mission of Chile, Vienna

- **Space Weapons**

Deganit Paikowsky, Senior Researcher, Yuval Neeman Workshop for Science, Technology and Security, Tel Aviv University, Israel

The second panel provided an opportunity to explore in depth some of the challenges facing the security and sustainability of the space environment. Mr Crowther updated participants on the current status of space debris and mitigation efforts. There are more than 16,000 catalogued objects in distinct orbits around earth including rocket bodies, operational spacecraft, mission-related objects, defunct spacecraft parts and other fragments. The proliferation of space debris causes significant danger for space-based assets. For example, a piece of debris the size of a coin in space has the same impact velocity as a bus travelling at 100 km per hour on Earth. Mr Crowther estimated that over 50,000,000 pieces of space debris were orbiting Earth with a combined mass of 5,000 tons.

Mr Crowther then turned his attention to potential solutions and mitigation techniques. Many mitigation efforts aim to minimize the potential for debris generation by removing defunct spacecraft from orbit, avoiding objects in one's orbital path, protecting operational spacecraft, and removing rocket bodies and satellites once decommissioned. Mr Crowther also argued that satellite operators need better mechanisms for sharing information to advance best practices.

He concluded his presentation with an exploration of lessons learned by satellite operators on space debris mitigation. He noted a growing need to focus mitigation efforts on the *cause* of debris generation rather than its *effect*. Additionally, as the space environment continues to deteriorate in part due to the proliferation of space debris, the cost of space access will increase significantly for all space-faring actors. In the light of these realities, Mr Crowther affirmed that active management of space debris will be necessary and that *best practices* need to become *common practices*.

Ms Alvarez expanded on the increased participation of new actors in the space domain, with a focus on Latin American States. Within Latin America, there is a disparity in individual State levels of technological development, but there is generally a widespread interest in harnessing the advantages and benefits of space research and technology to tackle issues such as natural resource management, weather forecasting, and disaster management, prevention and mitigation. Over the last few decades there has been a rise in national space programmes in Latin America. For example, Brazil and Argentina are considered the most developed actors, Peru and Bolivia operate small satellites, and other States such as El Salvador and Costa Rica are seen as emerging space-faring nations.

Because all Latin American States have an interest in, and increasing awareness of, the potential impact of space activities on modern society, they have become concerned about threats to space security. She expressed the view that it is essential to keep space free from weapons. She explained that Latin American States support the peaceful uses of space and uphold the regulation of activities regarding the exploration and use of space through international instruments such as international law, international customary law and international treaties. She said that an international, legally binding instrument is needed to prevent the placement of weapons in space; a ban on weaponization was essential for the preservation of space and the sustainability of space activities.

Ms Alvarez then focused on some key issues of concern to her region. Regarding space debris, she affirmed that the future of space activities largely depends on space debris mitigation and active removal. However, mitigation efforts should not lead to the adoption of overly high standards which may hinder progress by emerging space-faring nations and developing States. She remarked that Latin American States support the implementation of the Inter-Agency Space Debris Coordination Committee Space Debris Mitigation Guidelines and UNGA resolution 62/217 on international cooperation in the peaceful uses of outer space. Echoing previous comments by the Latin American and Caribbean Group in a variety of forums, she said that reaching consensus on the definition and delimitation of outer space would provide greater legal and regulatory clarity for all space-faring nations.

The final panellist, Ms Paikowsky, provided an in-depth exploration and typology of space weapons. In her presentation, she explained that the threats and challenges to the security of space systems come from both unintentional and intentional hazards; examples of the latter are space weapons. Space systems have three main parts:

1. space segments, i.e. satellites;
2. group (terrestrial) segments, i.e. stations and antennae; and
3. communication channels which link parts (1) and (2).

There are many challenges to space security and sustainability. Each part of a space system is susceptible to hazards. These can be categorized as follows: threats originating from the space environment and threats originating from human space activity, including both intentional and unintentional hazards. Her presentation focused on intentional man-made hazards. In her typology of intentional hazards and space weapons, such weapons could either be:

- soft-kill or hard-kill;
- based on denial (i.e. causing temporary and reversible damage) or destruction (i.e. causing permanent damage); and
- space-based or terrestrially-based.

She continued her presentation by examining various space weapons, identifying which part of the space system they target and situating them within her typology. They include direct energy weapons, radiofrequency interference weapons, anti-satellite kinetic weapons, electromagnetic pulse weapons, cyberweapons, etc. Moving to potential ways of achieving space sustainability, Ms Paikowsky emphasized the importance of increased awareness regarding the growing threat from space weapons, increased dialogue among military, civil and commercial actors, a standardization and regulation of relevant processes and techniques at the international and national levels, and a shift from focusing solely on the security of a particular space object to ensuring the sustainability of entire space systems.

The discussion period for Panel 2 further explored the definition and scope of space weapons. There followed a wider conversation on other threats to the space environment, including solar storms. One participant noted the need to define space weapons, while another remarked that the difference between, for example, a satellite removal system and a space weapon is, in many ways, one of intent. On this last point, other participants affirmed the need for greater transparency to clarify issues of intent.

Keynote Address

- **Kim Won-soo**, Under-Secretary-General and High Representative for Disarmament Affairs, United Nations

The United Nations High Representative for Disarmament Affairs provided an update on the existing momentum on space security within the United Nations system. Mr Kim remarked that this annual conference had become a valuable standing forum for facilitating international dialogue on space security. Regarding multilateral space security processes, Mr Kim noted that there are three major trends and developments. The first is a growing unity among the three largest space-faring nations, China, the Russian Federation and the United States, on measures to foster understanding and trust as well as reduce the potential for misperception and miscalculation. These measures are necessary to reduce military confrontation in the space domain and contribute to the prevention of an arms race in space. Furthermore, such measures continue even though disarmament machinery within the United Nations system is currently deadlocked. The stronger this unity, the better it is for the security of space.

Second, Mr Kim said that a common interest has emerged in enlarging this spirit of unity to include all States. He reiterated that the space domain is a common heritage for all, meaning that measures for space security are of concern to the entire international community. He noted the current momentum built by the UNGA, including the joint meeting on space of the First and Fourth Committees during the seventieth UNGA, had proved highly useful, but also argued that further dialogue on space security matters was needed.

Thirdly, the United Nations system has a key role to play in building and sustaining momentum. He acknowledged that United Nations bodies needed to work better together and in pursuit of this, UNODA has strengthened its cooperation with UNOOSA. Together, the two offices are working to improve overall coordination within the United Nations system and to facilitate the implementation of the recommendations and measures from the 2013 UN GGE on space TCBMs. He informed participants that UNODA has become a member of UN-Space and will continue to work closely with UNOOSA on the preparation of an upcoming report on the implementation of space TCBMs.

All States should recognize the importance of space security to the achievement of international security and disarmament objectives, including nuclear arms reductions, non-proliferation crises, regional disputes and terrorist acquisition of chemical, biological, radiological and nuclear materials. These challenges are steadily converging and TCBMs could serve as a platform for more ambitious measures. Indeed, more dialogue is needed in forums where space security is raised. Mr Kim saw great value in the seventieth UNGA First and Fourth Committee Meeting on Space and hoped that it could be repeated. The growing unity, which he mentioned at the beginning of his address, was not only welcome but also vitally important to strategic security and the future of disarmament. He concluded his remarks by reminding participants that the international community should take steps this year and beyond to ensure long-term security and sustainability in the space domain.

Panel 3 Emerging Issues

- **Small Satellites**

Tony Azzarelli, VP Regulatory Affairs, OneWeb

- **Commercial**

Jean-François Bureau, Director of Institutional and International Affairs, Eutelsat

- **Cyberspace**

Caroline Baylon, Information Security Research Lead, AXA

Panel 3 explored emerging issues which concern all space-faring actors. Mr Azzarelli presented developments within OneWeb, a satellite constellation which aims to provide a global Internet broadband service. At present, an estimated 54 per cent of the world's population is either not connected to the Internet or is underserved. A new actor in the satellite field, with an expected 648 small satellites operating in low earth orbit by 2020, OneWeb seeks to bridge this digital divide by providing cost-effective global broadband coverage. The constellation will seek to increase global citizenship in the digital economy including through e-government, e-medicine, e-learning, e-commerce, e-office, teleconferences, cloud computing and e-gaming. Examples of OneWeb initiatives include

providing rural broadband access for schools and integrated Wi-Fi and cellular connectivity at small kiosks around the world.

Mr Azzarelli emphasized that OneWeb strives to operate more responsibly than current regulatory policies require. He explained that efforts are made to ensure the responsible use of the space environment, including disseminating positional knowledge of OneWeb satellites, conducting in-orbit flight coordination and data-sharing, and designing satellites for demise upon re-entry into earth's atmosphere as opposed to leaving them decommissioned in orbit.

The next presenter, Mr Bureau, gave participants another commercial perspective on space activities and security processes. Eutelsat is a leading satellite company with a fleet of over 40 satellites providing global coverage from geostationary orbit. Eutelsat is the product of a decision by European nations to pool satellite resources and share the collective benefits. The company holds 15 per cent of the global market for telecommunications provided by satellite services. Looking to the future, Eutelsat focuses on four elements in its innovation strategy: bandwidth efficiency, flexibility, customer experience and security.

On the subject of security, Mr Bureau paid particular attention to issues such as orbit management, interference and end-of-life satellite policies. Echoing many participants at this conference, he acknowledged the increased congestion of key orbits in today's space environment. This congestion drives the need for a stable and clear regulatory environment. Mr Bureau emphasized the need for a systematic and holistic approach to space security among all space actors, including the private sector, in order to ensure the expected level of security which satellite operators require to operate in the long term. He concluded his presentation by calling for stronger and more inclusive space governance, and affirmed that commercial operators such as Eutelsat are committed to contributing.

The final presenter on this panel, Ms Baylon, opened with some comments regarding her work at an industry think tank on cybersecurity established within AXA, a global insurance service company. AXA provides satellite insurance and is therefore interested in assessing relevant cybersecurity risks and their evolution. Satellites are susceptible to cyberattacks. Potential attackers can range from hackers to nation States, terrorists, and industry competitors with a wide range of motivations including espionage, propaganda, censorship, and military or financial gain.

She then provided a technical overview of how cyberattacks on satellites occur, focusing on jamming and spoofing. Jamming occurs when a false signal operating on the same frequency as a satellite's uplink or downlink is able to override the legitimate signal. Spoofing involves a false signal deceiving a receiver into thinking it is receiving a legitimate signal. Quite often the solution to a jamming attack is to change a receiver's frequency, but in a spoofing attack one is not aware that the incoming signal is false. This means that false data can be fed into a system which, for example, can cause issues within any system utilizing satellite data, such as shipping or aviation networks. Ms Baylon described some technical solutions to these issues, including building atomic clocks into terrestrial infrastructure such as a global positioning system, so that systems are no longer reliant on timestamps from satellites. She also lamented the widespread reluctance to encrypt data sent via uplinks and downlinks which means they remain susceptible to espionage of all sorts. She suggested that data encryption should become more widely practised.

Ms Baylon then provided a brief overview of potential cyberattacks on satellite hardware while satellites are in orbit. She explained that many satellites have on-board computers,

which means that they are susceptible to pre-installed malware that can be used for malicious purposes. Cyber-vulnerability does not merely include the transmission of data via uplink or downlink but also via the components of an on-board computer system. For example, one computer may have components from over 100 different States; some States may influence companies operating within their borders to install malware in a computer component, which then becomes part of a satellite's on-board computer. She concluded her presentation by pointing to the importance of international standards for regulating this type of activity as well as ensuring compliance with such standards.

The discussion period included technical queries regarding the identification of spoofing or jamming incidents and an exploration of the current regulatory framework for commercial satellite operators.

Panel 4

Space Transparency and Confidence-Building Measures

- **Implementing the GGE: Challenges for Space Security Diplomacy**

Ambassador (Ret.) Paul Meyer, The Simons Foundation

- **Soft Law Approaches to Space Security**

Tanja Masson-Zwaan, President, International Institute of Space Law, Leiden University

- **The Role of Space Situational Awareness in TCBMs**

Victoria Samson, Washington Office Director, Secure World Foundation

TCBMs are useful for moving the international community in a cooperative and collaborative direction as regards the security and long-term sustainability of the space domain. Panel 4 explored various TCBMs, including space situational awareness (SSA), those recommended by the 2013 UN GGE on space TCBMs, and those possible through soft law. In his presentation, Ambassador Meyer explored the challenges for space security diplomacy following the report of the 2013 UN GGE on space TCBMs. A consensus output from 15 national experts under the chairmanship of the Russian Federation, the 2013 report provided substantive and diplomatic measures for the promotion of international cooperation on space security. It provided a menu of potential TCBMs for all States to voluntarily adopt. The report was a significant embodiment of the momentum referred to in the title of the current conference. For him, the key question remained whether these well-crafted TCBMs were likely to be implemented in the near future.

In the post-2013 period, the Ambassador had observed four developments which may countervail cooperative security measures in space. The first is the diplomatic impasse over the establishment of legally binding measures in space, such as the PPWT. As noted by many preceding participants, the 2014 draft has been subject to critical analysis. Furthermore, at present, there is no subsidiary body at the CD to discuss this matter and the PPWT's architects appear unwilling to take the draft elsewhere for consideration. Therefore, it remains in diplomatic limbo. Substantive disagreements over the contents of the PPWT and the absence of any working body for reconciling divergent views is, according to Ambassador Meyer, a significant obstacle to progress on space security.

The second development is the breakdown of a consensus-based approach to space-related resolutions at the UNGA. At the sixty-ninth UNGA in 2014, the traditional pattern of

consensual policy expression was broken with the introduction of the NFP-related resolution 69/32. There was significant resistance to this resolution and while it passed in 2014 and 2015, it did so with a sizeable minority of States not supporting it. This initiative had introduced a discordant element into the previously consensus-based approach that had characterized UNGA pronouncements on space security.

Thirdly, Ambassador Meyer saw an escalation of threat perceptions in the space domain, including alleged weapon development programmes aimed at deploying counter-space capabilities and the retrenchment of threat rhetoric, which can only fuel an arms race and detract from diplomatic efforts to build greater cooperation.

The fourth and final development has been the failure of the EU to realize its ICOC. The set of measures, some new and others repackaged, represented an effort to safeguard the continued peaceful uses of space. However, the final round of multilateral negotiations in New York in July 2015 failed to produce the desired outcome and revealed major disagreements over the process and appropriate auspices for this politically-binding endeavour. The EU has not returned to the UNGA to seek a mandate for a new negotiation process, leaving the ICOC, like the PPWT, in diplomatic limbo.

In the light of these developments, Ambassador Meyer concluded his presentation by proposing four near-term steps to restore momentum at this crucial moment for follow-up to the 2013 UN GGE on space TCBMs. First, China and the Russian Federation should explore another forum, existing or ad hoc, to initiate discussion on the PPWT and legally binding arms controls, more generally. Second, States should practice strategic restraint as regards military space programmes and threat rhetoric while at the same time providing greater transparency. Third, a representative group of States should initiate a process at the coming UNGA to establish an open-ended working group to negotiate a code of conduct on outer space activities. Fourth, a conscious effort is necessary to pursue and re-establish common ground in considering the global regime in space; to this end, Ambassador Meyer suggested the possibility of using the upcoming fiftieth anniversary of the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (OST) for organizing a meeting of its States Parties.

The next presenter, Ms Masson-Zwaan, explored 'hard law' and 'soft law' approaches to space security. She began by distinguishing between the two. Examples of hard law are international law, international conventions, international custom, bilateral and multilateral agreements, national legislation, etc. Soft law, on the other hand, included guidelines (such as the Inter-Agency Space Debris Coordination Committee Space Debris Mitigation Guidelines or outputs from the COPUOS Long-Term Sustainability Working Group), codes of conduct (such as the EU ICOC, if it is adopted), and United Nations resolutions, as well as various contributions to soft law-making, such as recommendations, statements or position papers.

Ms Masson-Zwaan reminded participants of the principles of space treaty law, namely that the exploration and use of space and celestial bodies is the province of all humankind, that the appropriation of space and celestial bodies is forbidden, and that international law and the United Nations Charter apply to space activity. She then evaluated the potential for hard and soft law approaches to provide clear rules, transparency and confidence in the space domain.

In her conclusion, she reiterated that treaties and laws set the general framework for space security. However, they also leave gaps while at the same time, new needs and issues continue to emerge, such as space mineral resource management. The creation of new hard law takes time and political will and does not provide all the answers. In the meantime, soft law can help fill gaps and clarify key terms in a flexible and time-efficient manner. In this sense, Ms Masson-Zwaan suggested that soft law may be an acceptable way to ensure space security at all levels.

The final presenter on this panel, Ms Samson, explored the role of SSA as a space TCBM. She first highlighted the dual-use nature of space technologies and the importance of intent in space activities. A key question was how a space actor could demonstrate responsible, non-threatening use of space. Norms of behaviour and increased cooperation can help signal good intent and establish what is considered standard behaviour. For example, norms can provide a shared understanding among space actors, which can help cool tensions in times of crisis.

Ms Samson explained how using SSA can help improve transparency among space actors. She described SSA as the ability to accurately characterize the space environment and activities in space. Broader SSA can help identify activities that are potentially threatening to the stability of the space environment. Without any form of monitoring, she suggested that rules have little effect on State behaviour. For example, if a space actor were to act irresponsibly, it would be important to attribute and verify the activity in order to 'name and shame'. Currently, the US military is the largest provider of SSA data. There are other national programmes which could verify and amplify this information and help make SSA data more comprehensive and dependable. Ms Samson believed that independent, non-US-based SSA sources would help provide another perspective and improve everyone's ability to identify actions in space.

She then moved to the role of the commercial sector in SSA processes. Many commercial actors have expressed an interest in SSA data. Their role in space is expected to increase as the small satellite sector is set to grow from its current US\$ 2.2 billion market size to US\$ 5.3 billion by 2021. The growth of this sector will complicate SSA processes. She suggested expanding the SSA conversation to include more major space stakeholders and non-traditional partners, including emerging space actors. Predicting a series of emerging issues including legal, operational, security and policy challenges, Ms Samson concluded her presentation by emphasizing the continued importance of transparency, clarity of intent and norms of behaviour in SSA processes.

The discussion period revolved around the PPWT. Some participants preferred the CD as the appropriate negotiating body for the PPWT while others felt that an ad hoc diplomatic conference would be preferable. Another participant suggested that the PPWT had not yet reached the point at which negotiations could be opened.

Panel 5

Current Initiatives: Status Updates

- **PPWT**

ZUO Rui, Deputy Division Director, Department of Arms Control, Ministry of Foreign Affairs, People's Republic of China

- **No First Placement of Weapons in Space**

Vladimir Yermakov, Deputy Director-General, Department for Non-proliferation and Arms Control, Ministry of Foreign Affairs, Russian Federation

- **International Code of Conduct for Outer Space Activities**

Bruno Hanses, Senior Expert for Disarmament and Non-proliferation, European External Action Service, European Union

- **COPUOS Long-Term Sustainability Working Group**

David Kendall, Chair, United Nations Committee on the Peaceful Uses of Outer Space (COPUOS 2016–2017)

Currently, a series of initiatives concerning the multilateral space security regime are under consideration by the international community, including the PPWT, the NFP initiative, the ICOC and the work of the COPUOS Long-Term Sustainability Working Group. This panel sought to bring together the architects of these initiatives to provide some status updates. In her presentation, Ms ZUO gave an overview of the PPWT process. From 2002 to 2006, tentative research was carried out on possible legal instruments to prevent weapons from entering space. In this period, a series of documents were submitted to the CD which explored ways of addressing issues regarding key definitions, verification mechanisms and TCBMs. Tabled in 2008 by China and the Russian Federation, the PPWT was the product of that research and other efforts by the international community. Ms ZUO explained that in 2014, China and the Russian Federation had submitted an updated draft text of the PPWT, which gained widespread support. In 2015, after incorporating comments from other States, they submitted a document to the CD addressing issues raised by the 2014 draft PPWT.

In recent years, orbital congestion, deterioration of the space environment and space debris have all created substantial challenges for the international community. However, the threat of weaponization has been omnipresent and is increasing. Ms ZUO noted that while the PPWT is not perfect, it is the most viable process for the time being. The PPWT is preventative in nature. It attempts to strike a balance between States' rights and obligations, while recognizing the right to self-defence enshrined in the United Nations Charter. She then addressed long-standing issues regarding the PPWT. On the issue of a viable verification mechanism, she said that while many arms control treaties have verification mechanisms, many also do not, such as the OST and the Biological Weapons Convention. Furthermore, the current draft PPWT contains important elements of verification in the form of consultative mechanisms, which can be implemented in case any State party is suspected of a treaty violation. She believed that verification could be established in future discussions when the political climate is more favourable.

In short, the PPWT had been greatly improved through an open and constructive process. Ms ZUO said that she hoped that all members of the CD could sustain the current momentum and engage in issues related to the updated draft PPWT with the aim of negotiating and eventually adopting a legally binding arms control agreement in the space domain.

Mr Yermakov provided a status update on the NFP initiative which, in his words, represented a political invitation to not have weapons in space. The goal of the NFP initiative is to have no placement of weapons in space. The initiative is seen as a first step towards that goal. Responding to numerous interventions during the conference questioning the presence of the word 'First' in the NFP initiative, Mr Yermakov expressed readiness to consider deleting it from the text and title of the resolution. He said that if every State took an NFP obligation, then we would have a global political commitment not to place weapons in space. This would, according to Mr Yermakov, pave the way for a legally binding treaty banning the placement of weapons and use of force against space-based assets.

To promote the PPWT, the Russian Federation had launched the NFP initiative. This occurred before the PPWT was formally tabled at the CD in 2008. The Russian Federation took an NFP commitment in 2004 and members of the Collective Security Treaty Organization joined in 2005. Brazil did so in 2012. In the following three years, six more States joined. He noted, in addition, the substantial support for NFP-related resolutions in the UNGA. In 2014, 126 States voted in favour of resolution 69/32 which called for greater NFP-related dialogue. In 2015, NFP-related resolution 70/27 obtained an increased number of votes in favour (130). The NFP initiative is an extremely important TCBM according to Mr Yermakov. It is an important and credible indicator of a State's responsibility for its space activities and its desire to not place weapons in space. He concluded by inviting participants to take part in increased dialogue on the matter.

As the EU's contributor, Mr Hanses updated participants on the ICOC. The politically binding ICOC process began in 2007 in response to UNGA resolutions 61/75 and 62/43, and the United Nations Secretary-General's call for concrete proposals on space TCBMs. The first draft ICOC was presented to the international community in Vienna in June 2012. The EU then organized three rounds of global consultations on the draft text. Over 95 United Nations Member States participated in this process. The EU felt there was broad support for the objectives of the ICOC despite strong disagreements on several parts of the code.

The EU hopes to achieve the following from the ICOC process: increased international cooperation, established standards of responsible behaviour across a range of space activities, a commitment to non-interference in the peaceful exploration and use of space, equitable access to the space domain, and increased transparency of space activities. In July 2015, a series of meetings were held, at the United Nations in New York, where the ICOC was discussed in detail. Mr Hanses explained that in the aftermath of these meetings and in taking stock of processes on global space governance, the EU has reassessed its objectives and approach as regards the ICOC. It has arrived at three conclusions. Firstly, the EU should continue to show leadership in the space domain, which is important to European security and property, despite difficulties in making multilateral progress. Secondly, the EU believes that a non-legally binding agreement governing military and civilian activity is the appropriate way to proceed. And lastly, such an agreement should be negotiated within the United Nations when and if conditions become ripe for such activity. He concluded his presentation by noting that the EU remains committed to achieving these goals and is ready to work constructively with all nations to this end.

The following presenter, Mr Kendall, provided a status update on the work of the COPUOS Working Group on the Long-Term Sustainability of Outer Space Activities. Established in 2010, the working group's goal is to develop a set of best practices for space activities with a focus on protecting the space environment. He emphasized the working group's complex and challenging task given the wide scope of possible topics and the divergent views of

Member States. The working group is comprised of four expert groups which focus on the following subjects:

1. sustainable space utilization supporting sustained development on Earth;
2. space debris, space operations and tools to support collaborative SSA;
3. space weather; and
4. regulatory regimes and guidance for actors in the space domain.

The expert groups propose voluntary measures in order to provide a foundation for the development of national and international practice and safety frameworks for space activities. As regards the future, Mr Kendall reminded participants that 2018 marks the fiftieth anniversary of the first United Nations Conference on the Exploration and Peaceful Uses of Space (UNISPACE), held in Vienna in 1968. COPUOS decided in 2015 to use this upcoming anniversary to renew and strengthen its mandate as a unique platform for the interrelationship between established and emerging space-faring nations. This process will be branded UNISPACE+50 and will help the COPUOS agenda to address the current challenges faced by space actors. He notified participants of some upcoming UNISPACE+50 dates: 20-24 November 2016 will be the First High Level Forum, entitled 'Space as a Driver for Socioeconomic Sustainable Development', to be held in Dubai, United Arab Emirates. The Second and Third High Level Forums will be held in 2017 and 2018, respectively.

The discussion period enabled government representatives to express their positions regarding many of the initiatives discussed on this panel, including the NFP initiative, the PPWT and the ICOC. There were divergent opinions regarding next steps in the multilateral space security regime, particularly as to whether politically or legally binding agreements were most appropriate. Issues of verification mechanisms, self-defence clauses and timelines for future negotiations were discussed.

Panel 6 United Nations Machinery

- **UNOOSA**

Niklas Hedman, Chief, Committee, Policy and Legal Affairs Section, United Nations Office for Outer Space Affairs, Vienna

- **UNODA**

Michael Spies, Political Affairs Officer, United Nations Office for Disarmament Affairs

- **ITU**

Attila Matas, Head, Space Publications and Registration Division, Radiocommunication Bureau, International Telecommunication Union

There are many United Nations bodies engaged in the multilateral space security regime, and Panel 6 sought to expand on some of these bodies' unique roles. The first presenter, Mr Hedman, provided a comprehensive overview of UNOOSA's mandate, outputs and upcoming preparations for UNISPACE+50. UNOOSA conducts a wide range of activities as part of its mandate, including serving as the Secretariat to COPUOS and its Scientific and Technical Subcommittee and Legal Subcommittee, serving as the Secretariat to the UNGA Fourth Committee on the space agenda item, discharging the responsibilities of the United Nations Secretary-General under the five United Nations treaties and five sets of principles

on space, maintaining the Register of Objects Launched into Outer Space, coordinating space-related activities within the United Nations system (UN-Space), implementing the United Nations Programme on Space Applications, implementing the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) programme, and operating a capacity-building programme on space law.

He continued by elucidating UNOOSA's space security and governance partnerships and initiatives followed by the goals and thematic priorities of the 2018 UNISPACE+50 process. Linking the work of UNOOSA with the adoption of the 2030 United Nations Agenda for Sustainable Development, he illustrated that global sustainable development not only implies the use of space tools but also requires the long-term sustainability of the space domain itself. The near-Earth environment is fragile and the increased strategic value of space means that there is also a growing need to enhance the safety of space operations and the security of space-based assets and systems. His concluding remarks included a consideration of strengthening TCBMs under space law, enhancing information exchanges and risk reduction notification procedures, and implementing future space-traffic management frameworks.

Speaking from the perspective of UNODA's headquarters in New York, Mr Spies focused on two issues of concern for the space security community: machinations within the United Nations Disarmament Commission (UNDC) and UNODA's work on the implementation of space TCBMs. On the first issue, Mr Spies explained that within the UNDC there has been recent discussion regarding the adoption of a third agenda item on space. Within the present UNDC cycle, this conversation has evolved with the introduction of a joint proposal by China, the Russian Federation and the United States for the third agenda item on recommendations for TCBMs with the goal of preventing an arms race in outer space. Over the course of various consultations and an informal meeting of the UNDC on 21 April 2015, several procedural concerns emerged over the proposed item, including its statutory basis. Mr Spies affirmed that it is within the UNDC's purview to adopt a third agenda item. In the intersessional period before the 2017 UNDC session, Mr Spies acknowledged that a number of issues will need to be resolved, including the timing and sequencing of space-related work and the question of how to balance this item with existing ones on the agenda.

The second issue relevant to space security was UNODA's work on implementing space TCBMs. As an illustrative example, he raised the TCBM from paragraph 38 of the 2013 UN GGE report on space TCBMs, which relates to States reporting on military space expenditure. UNODA annually solicits input regarding this reporting mechanism via *notes verbales* and encourages Member States with military space activities to include expenditures as well as other national security activities, as applicable. Mr Spies said that there are currently roughly 20 States which operate military dual-use satellites; however, none of them have addressed relevant military expenditures in their reporting documents. In the future, he saw value in UNODA conducting better outreach and in raising this reporting mechanism at an upcoming 2016 UN GGE which will review the operation and further development of the report on military expenditures.

The final panellist, Mr Matas, situated the role of the ITU within multilateral space activities. The ITU plays a key role in managing orbit-spectrum resources, supporting developing States in the implementation of, and capacity-building for, information and communication technology (ICT)-related projects, and facilitating the development of international standards defining elements in the interoperability of the global ICT infrastructure. One key example of the centrality of the ITU to space activities is its involvement in radiocommunications that allow terrestrial communication with space-based assets. The ITU Radio Regulation governs

the use of spectrum and orbit resources by all radiocommunication services. Additionally, the Regulation helps to ensure the availability and protection of radiofrequencies provided for distress and safety purposes.

Mr Matas explained the legal framework for the ITU's work on space activities, with specific reference to the OST and Articles 44 and 45 of the ITU Constitution. The objectives of these two articles of the ITU Constitution are to ensure the rational, equitable, efficient and economical use of the radiofrequency spectrum and satellite-orbit resources, to avoid harmful interference, and to establish global standards to ensure the necessary performance, interoperability and quality. He then provided an overview of the ITU's radio regulation mechanisms.

The discussion period for this panel picked up on Mr Matas' comments regarding the ITU's role in space activities. One participant enquired about the allocation process for radiofrequencies in space. Another asked about the ITU's mechanisms for monitoring and reporting harmful interference. One participant explained that several memoranda of understanding had been established between the ITU and Member States regarding the reporting of harmful interference.

Ambassador Meyer provided some concluding remarks. He acknowledged that both panellists and participants had held a great deal of substantive discussions covering a variety of topics and perspectives. At a time when many multilateral space security processes are stalled, discussions such as these were essential. On behalf of The Simons Foundation, the Ambassador thanked Secure World Foundation, UNIDIR, and the governments of Canada, China, the Russian Federation and the United States for their support. In conformity with the theme of the conference, he said that he hoped that the international community could continue to sustain the momentum towards a secure and stable space domain.

On behalf of UNIDIR, Mr Sareva thanked The Simons Foundation and Secure World Foundation, as well as the governments of Canada, China, the Russian Federation and the United States for their support for this year's iteration of UNIDIR's Space Security Conference Series. He commended participants and presenters on the rich and broad set of issues covered over the previous two days and looked forward to more discussion and cooperation on space security matters.



UNIDIR

UNIDIR Space Security Conference 2016

Sustaining the Momentum: the Current Status of Space Security

Following the 2015 joint session of the UN General Assembly's First and Fourth Committees on possible challenges to space security and sustainability, during which states discussed various options for preserving space for peaceful uses and preventing an arms race, and the consensus adoption of the First Committee resolution on Transparency and Confidence-building Measures in Outer Space, UNIDIR's 2016 Outer Space Conference focused on the current status of issues and processes critical to maintaining space as a peaceful domain.