

Report of the 61st Colloquium on the Law of Outer Space

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Session E7.1: 10th Nandasiri Jasentuliyana Keynote Lecture on Space Law and Young Scholars Section

Co-Chairs: Kai-Uwe Schrogl and Lesley Jane Smith

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The 61st IISL Colloquium on the Law of Outer Space commenced with the 10th Nandasiri Jasentuliyana Keynote Lecture, which was delivered by Dr. Marco Ferrazzani, Legal Counsel of the European Space Agency and member of the Board of Directors of the International Institute of Space Law. The keynote lecture was dedicated to “Space Law and International Organisations” and Dr. Ferrazzani began by thanking the IISL for the invitation and commending the distinguished personalities of the previous keynote lecturers. He then laid out the purpose of his speech, to assess the relevance of international organisations to the current state of space exploration and their role in the advancement of international space law.

Dr. Ferrazzani began his presentation by highlighting the inherently international character of space exploration and use, as well as the operation of international organisations with the aim of achieving the common goals set out by countries on an international level. In assessing the contribution of international organisations to the development of space law, he mentioned their mandate to perform space activities and their involvement in the making of space law, in ways that their function reflects the practice of their State parties. He underlined that space law itself was shaped by an international organisation, the United Nations, which was instrumental in the negotiation and the achievement of consensus on the text of the five international space treaties. Since this is not an exclusive task for international organisations, he emphasised on the role of the States in this regard and pointed out that further expansion of regulatory mechanisms would contribute to the fragmentation of the law.

The keynote lecture then focused on the methods of legal analysis of the functions of international organisations, among which Dr. Ferrazzani identified the normative, the executive and the jurisdictional function. The first refers to the extent to which States provide competencies to international organisations for formulating and developing international law, the second is translated to the application of the established rules of space law through the means vested to these organisations, whereas the third addresses the normative authority of space law deriving from the practice of international organisations.

Within the normative function, Dr. Ferrazzani identified two instances where space law was advanced through international organisations, one before the 1980s when States concluded the international space treaties and another one in the decades that followed when States developed further specific aspects of the treaties. He also praised this normative function for distinguishing the leading States in international space law decision-making. Furthermore, he highlighted its significant impact in establishing the ITU frequency allocation system, which ensures equitable access to outer space and avoidance of harmful interference in the conduct of space activities. Dr. Ferrazzani indicated that despite the wide recognition of the Outer Space Treaty and the role of international organisations in its advancement, it does not yet enjoy universal status, as it is only binding to the States that have ratified it. Nevertheless, the customary value of its provisions could be asserted by its normative effect on the behaviour of States in outer space. Summing up the contribution of international organisations, he brought up the example of UNIDROIT in procuring private space law regulations, IADC in establishing norms for space debris mitigation, ESA and the EU in carrying out part of or entire space missions assigned to them by their member States, as well international telecommunications organisations that have greatly advanced regulations in that field. With regard to the jurisdictional function, he mentioned instances where international organisations were under the obligation to perform in accordance to international space regulations. In particular, he referred to the acceptance on behalf of international organisations of the obligations stemming from the space treaties, and to the jurisdictional exercise of space law through international organisations as a mechanism of confirmation of the status and authority that international space law has achieved.

Dr. Ferrazzani continued with the observation that the current state of international relations is different from the one under which the space treaties were concluded and that security and peaceful space exploration are not the only primary concerns. Consequently, he noted that the connection between international organisations and society is also undergoing changes and made reference to factors that drive this change, such as major events that affected the international political scene and the aftermath of the global financial recession. He suggested that, despite the efforts of individual countries to

protect and promote their own interests, it is through the collective effort of the States that the space sector has advanced in the past six decades. Moreover, he stated that if individual regulatory initiatives prevail in the types of space activities that are driven by multilateral agreement of States, such as space debris, space resources, and frequency allocation, the notions of sharing of benefit and of province of mankind will be deprived of their meaning.

As concluding remarks, Dr. Ferrazzani addressed the need for current laws to adjust to the changing circumstances and the importance of cooperation and benefit-sharing among countries for the preservation of the established principles of international space law. He finally highlighted that international organisations can serve as platforms for such collaboration and invited the audience to become involved in the global space community.

The session continued with the Young Scholars Session, where university students and young professionals presented papers on a wide variety of space law topics. The first paper was co-authored by Deepika Jeyakodi and Narayan Prasada Nagreda and was titled “India’s Draft ‘Space Activities Bill’: Implications for the commercial space industry”. The paper was presented by Deepika Jeyakodi and was dedicated to the content and objectives of India’s draft national space legislation. Deepika elaborated on the main provisions of the draft law, such as definitions, licensing requirements, damage liability, and penalties. She also addressed the application scope of the draft law, which is limited to Indian national and legal persons. This draft law was introduced as a response to the growing presence of private entities to the Indian space industry, which rendered previous regulations insufficient. Its purpose is to encourage private activities and investments, to balance any conflicting interests, as well as to develop a space sector that would offer a full range of space services. Deepika concluded with a general assessment of the draft Space Activities Bill, suggesting that it provides concrete provisions and supports the creation of a viable public and private ecosystem within the Indian space sector.

The next paper by Tugrul Cakir was titled “From the unilateral acts of States towards unilateralism in space law”. The presentation began with a definition of unilateralism, which refers to the individualistic approach of States in their international relations, paired with several examples of unilateral acts of States in international law. In the framework of space law, the cases of space resources, delimitation of outer space, export control, and active debris removal without consent were mentioned as instances of the unilateral behaviour of States. It was supported that even though States favour unilateral or bilateral agreements instead of multilateral consensus, international space law is constructed upon the basis of cooperation among countries. In the end, the author made a distinction between converging and diverging state practice and raised the question whether the unilateral

behaviour of States in the space sector can be seen as an opportunity rather than a challenge.

Further on, Vincent Seffinga addressed the topic of national laws on remote sensing. In his presentation “Regulating remote sensing in national space legislation to increase legal certainty on an international level”, he outlined the different uses of remote sensing and highlighted their commercial potential, so as to draw the attention to the need for legal certainty and more efficient regulation. In his analysis, he made reference to several national legislations related to remote sensing activities, namely the French, German and US law respectively, in conjunction with the provisions of the Outer Space Treaty and the UN Principles on Remote Sensing. He recommended a bottom-up approach in international law-making, which would be guided by practice, national law and other relevant instruments. He also advocated in support of international rather than national regulation in the field of remote sensing. However, given the insufficiencies and limited scope of the current international regime, national law could provide guidance through establishing practice and standards.

Hamza Hameed followed with a paper on “The concept of launching state in a democratized NewSpace”. His presentation focused on the notion of the launching State in light of the democratisation of space activities with the growth of NewSpace. He began with the definition of the launching State based on the Outer Space Treaty, as further explained in the Liability Convention and in the Resolution on “The Application of the Concept of the Launching State”. He then explained the ways in which the increase in the number of launches, the subsequent decrease in the costs involved, and the development of new launching technologies have democratised the space sector and have made launches more accessible to innovative missions. At the same time though, this democratisation along with the modern cooperative launching models and other on-orbit projects have raised challenges in detecting the launching state for the purposes of international space law. Highlighting the importance of the latter, he suggested several mechanisms for the identification of the launching state, such as detailed registration of the launched object, elaborated licensing requirements, development of standards for in-orbit transactions, as well as an introduction of provisions for the transfer of launched space objects.

The next presentation was titled "Can Japan launch itself into becoming a leader in the global space business with its new space legislation" and was delivered by Masaya Uchino. In the beginning, it was mentioned that, given that Japan was one of the first States to launch an object into outer space and remains among the few countries with its own launching capabilities, the Space Activities Act came as a late development, when the pre-existing regulations were proven insufficient. In particular, the previous regulatory framework, which included provisions on licensing, damage, and liability, was not anymore adequate in regulating the increasing consignments of

JAXA to private actors for the manufacturing and launching of space objects. Therefore, the need for a concise national law became apparent and the Space Activities Act, entering into force in November 2018, was introduced in 2016. The Act provides for a detailed licensing scheme and covers a broad spectrum of space activities. It also sets up a unique liability regime, which is limited to Japanese nationals and parties directly involved into the launch, in an effort to attract foreign investment and to promote the development of the private sector. The presentation concluded with reference to the principal aims of the Space Activities Act, the competitiveness of the Japanese space sector and the encouragement of private funding.

Gina Petrovici presented the next paper concerning the legal challenges of Space 4.0. At first, she outlined the four main space “eras”, which began with astronomy (Space 1.0) and competition among States (Space 2.0), continued into a period of cooperation among countries (Space 3.0) and are currently developing into the Space 4.0 ecosystem that encompasses society, politics, science and industry. She mentioned the examples of the latter stage from Europe and the US and made reference to the ESA Space 4.0 initiative, which is driven by innovation and interaction. Gina proceeded with explaining the impact of the current status of industrial and technological advancement on the application of the existing regulations. In particular, she pointed out that the attribution of responsibility and liability to States has become cumbersome due to the development of new technologies, the embracement of business opportunities, and the reliance on automated systems. Therefore, she identified among the challenges the commercialisation of space activities and the growing cybersecurity threats. In the way forward, she suggested that traditional space players should adapt in order to accommodate NewSpace activities, whereas NewSpace actors should pay an effort to comply with the existing legal obligations.

Later on, Huxiao Yang presented the paper titled “Can ‘giant’ and ‘tiny’ co-exist peacefully? The design of rules preventing collision in outer space and the boom of micro-satellites”. First, he highlighted the benefits offered by micro-satellite technology, including low launching and operational cost, which resulted in a thriving market in this field. He then referred to their particular features that render them challenging in terms of regulation, namely their low detectability and their inability to manoeuvre. He also explained the basic rules of collision avoidance, such as safe distance, visibility, and right of way, which prevent micro-satellites from mitigating the risk of collisions. In analysing potential regulatory solutions, Huxiao drew a parallel with micro-UAVs, which have similar characteristics in terms of operation and regulation. Finally, he suggested two primary mechanisms for reducing the risk of collisions caused by micro-satellites. The first would be based on space traffic management, and the second would adopt a hierarchical management approach based on risk levels, operational requirements, and the type of micro-satellite operator.

The next paper was presented by Yangzi Tao and was based on a comparative analysis of the US and Luxembourg national laws regarding space resource activities. The analysis focused on the contrast between national laws that permit exploitation of space resources and the prohibitions set up in Articles I and II of the Outer Space Treaty and Article 11 of the Moon Agreement. In the first part of the presentation, Yangzi analysed the provisions of the domestic laws of the US and Luxembourg and laid down their main elements, which allow nationals of these countries to use space resources for commercial purposes. On the one hand, it was supported that such provisions could be considered contrary to the space law principles of non-appropriation and of freedom of use of outer space. On the other hand, given the lack of definitions and the loopholes in space law, the said national laws could be interpreted as compliant to the space treaties. The second part provided recommendations for balancing the contrast between the national and international regime on space resources governance. In particular, it was recommended that the national laws established by space-faring nations can be a way of implementing and complying with the obligations prescribed in the space treaties. At the same time, cooperation with non-space faring nations should also become a priority and international agreements on this topic should be concluded.

Andrea Capurso was the recipient of the Diederiks-Verschuur award for his paper "The non-appropriation principle in outer space: A Roman interpretation". Andrea provided a summary of the history and main elements of Roman law, before outlining the characteristics of the term *res communis omnium*. The latter refers to things that are covered by the freedom of access and use and the prohibition of appropriation. In the case of outer space, this notion could be interpreted in two different ways. First, exploitation could be considered in principle prohibited. Second, it could be translated as permitting exploitation of the extracted resources without consuming entirely the resources of a celestial body. Towards addressing this dilemma, Andrea attempted to connect the main elements of the "common thing", namely the container that surrounds it and the content which comprises it, to the definition of outer space. In lack of the latter, he deployed various definitions based on international treaties and on scientific facts.

The next paper by Scarlet Wagner was titled "Bee-fore the swarm: Swarm technologies' unauthorised deployment of small satellites and Article VI of the Outer Space Treaty". At first, she described the Swarm mission for launching the Bee satellites and its licensing procedure that resulted in a dismissal of the permission to launch. On this basis, she analysed the content of Article VI of the Outer Space Treaty regarding the responsibility of States for the activities of their nationals, as well as the provisions of international law regarding the responsibility of States for internationally wrongful acts. She concluded that on both grounds it was difficult to identify which State was responsible for the satellites and that the State that launched them could

only be considered a launching State for the liability purposes of the space treaties. Therefore, she suggested that the existing regulatory framework does not provide a repercussion for the unauthorised deployment of satellites, and the question regarding which State should authorise and supervise such activities remains unanswered.

Upasana Dasgupta presented the next paper titled “Do national space laws look beyond liability for damage? A Case of India”. In her analysis she supported that national laws tend to focus too much on the allocation of liability, taking particularly into account the draft Indian Space Bill. Consequently, other provisions stemming from internationally undertaken obligations might be either overlooked or not sufficiently mentioned. Her main question was whether domestic space laws should only be based on Articles VI and VII of the Outer Space Treaty, that respectively refer to international responsibility and liability. After justifying her negative response, she proceeded to suggest that a way to overcome this omission in national space laws is to include more diverse provisions or include the fulfilment of international obligations among the licensing requirements.

The last paper “Back to the Moon: Legal challenges for future lunar exploration” was presented by Antonino Salmeri. Antonino began with a brief history of lunar exploration from the Apollo missions to ongoing exploration projects. He mentioned that the key to success of present and future lunar exploration missions is the cooperation between space agencies and governments with the private sector, in order to ensure a concrete level of technological development and financial sustainability. Towards this end, he proposed two collaborative models, a traditional one resembling the Intergovernmental Agreement for the International Space Station and an innovative one based on public-private partnerships models in accordance with the Outer Space Treaty. Despite its rigid provision and public-sector governance, an intergovernmental agreement could provide adequate legal certainty along with the security that the support of the cooperating States would provide. On the other hand, an innovative approach would allow for flexible and adaptive governance, as well as increased participation of the private sector, but could entail the risk of overall abandonment of lunar exploration if full agreement among the partners is not reached. He concluded that there is no one right model for future lunar exploration, but rather a responsible choice among several appropriate methods.

Session E7.2: Financing space: Procurement, competition and regulatory approach

Co-Chairs: Dr. Ingo Baumann and Catherine Doldirina

Rapporteur: Gina Petrovici

Session E7.2 consisted of various papers engaging with regulatory frameworks and challenges related to the procurement or financing of traditional and new space activities.

Maria Gagliardi presented a paper entitled, “Public Procurement rules, forms of financing and their impact on competition in the space field: a general overview with a focus on the Italian legislative framework and its practical implementation”, pointing out the fundamental role of procurement rules and various forms of public funding in the field of research, development and innovation. Although the involvement of private entities in space activities is increasing, public resources still form a substantial part of funding for space programmes. Therefore, public grants and procurement schemes remain particularly important for the technological advancement of the entire space industry. Further, Gagliardi listed peculiarities in the space sector, which are mainly characterized by the long development cycle of space projects, the *per se* dual-use nature of space technologies, the high costs of access to space, economies of scale and the central role of public entities. She continued with contracts awarded through public procurement. Public Procurement regulations aim to promote fair and open competition while at the same time minimizing the risk of discrimination and fraud. In Europe the EU Public Procurement Directives coordinate national procurement regulations. State aid as regulated in the Articles 107-109 TFEU is another form of public financing. Gagliardi referred to EU Regulation No. 651/2014 as current framework for state aid for R&D. The Italian Government enacted the Legislative Decree No. 50/2016 greatly innovating the existing regime. ASI is bound by the provisions of EU Regulation No. 651/2014 and the respective national implementation Legislative Decree No.50/2016. The newly introduced Innovation Partnerships are followed by ASI as reflected in its recent involvement in the project “IntalGovSatCom”. Finally, Gagliardi also underlined ASI’s cooperation with ESA and other space agencies often under intergovernmental agreements. The presentation was followed by numerous questions from the audience relating to new financing schemes in the New Space context, such as the Commercial Orbital Transportation Systems.

Mark Sundahl presented next, and his talk focused on the historic evolution of U.S. public procurement in the changing landscape of space activities. His paper is entitled “The U.S. procurement models as a tool for growing private industry”. Sundahl, as other speakers in this session, noted that public-private partnerships (PPP), broadly understood as intensive collaboration between the public and the private sector, is a tool for governments to

promote the private space industry. Sundahl noted the history of procurement in the U.S. from the very start of the Space Age, when private U.S. companies were subcontracted with the construction, launch and operation of the spacecraft. After listing numerous examples of private involvement in U.S. institutional space missions, Sundahl focused on the particularly interesting aspect of U.S. procurement history, namely the emergence of private launch services. In 1984, he noted, President Reagan issued an Executive Order designating the Department of Transportation (DOT) as the lead agency for commercial space transportation to eliminate the regulatory complexity faced by SSIA by identifying a single agency that would serve as a “one-stop-shop” for companies seeking a launch license. In the same year, the Commercial Space Launch Act (CSLA) was enacted and remains to serve as the legal foundation for regulating private space transportation. Sundahl then presented the changes made due to the 1986 Space Shuttle Challenger tragedy. The U.S. Launch Strategy 1986 then restricted NASA’s launch of commercial satellites to only those requiring the “unique capabilities” of the Shuttle. This reflects the beginning of the exponential growth of private involvement and investment in space activities. In 1988 the Presidential Directive on National Space Policy obliged government agencies to use commercial launch service providers to the fullest extent feasible. In addition, Sundahl outlined the two main NASA public procurement tools: traditional procurement procedure and acquisition through the Space Act Agreements, which are mainly used to fund endeavors that support NASA’s goals and missions outside of the standard procurement scheme. Space Act Agreement acquisitions require NASA to commit its resource in the form of goods, services, facilities, or equipment. Sundahl introduced the audience to the four main types of Space Act Agreements. He concluded by noting the variety of opportunities for procurement and partnerships in the U.S. that can educate future entrepreneurs, scientists and lawyers.

Milton S. Smith further addressed the issue of Public-Private Partnerships (PPPs), in particular, complex, very large, multi-party construction projects, where PPPs have been used for the infrastructure. The presentation of his paper, entitled “Using Public–Private Partnerships to Finance Very Large Space Projects” started by explaining the concept of PPPs, which are alliances between government entities and private enterprises to accomplish a common purpose. A prominent example is the Commercial Orbital Transportation Systems (“COTS”). Smith highlighted that future space missions, such as the establishment of a Deep Space Gateway, the installation of Moon bases and the active removal of space debris, require complex contractual arrangements, international cooperation and extended performance periods. Moreover, he discussed the International Space Station as guiding best practice for a complex legal structure and excellent organizational basis for PPPs for the application in future specifically large space missions. Smith

stated that lessons learned from large terrestrial PPPs infrastructure projects can as well be applied to those future large space projects.

Anna Veneziano, together with her co-author Hamza Hameed, in their paper “The Space Protocol of the Cape Town Convention: An International Secured Transaction Regime for Space Assets”, highlighted that the Space Protocol provides a predictable international system for companies of all sizes to gain access and finance their endeavors at potentially attractive conditions due to its reliance on asset-based financing techniques. She noted that the Space Protocol has to be understood as an additional opportunity for the financing of space assets rather than a replacement of existing financing models. Veneziano submitted that the Convention and Protocols provide the creditor with a range of basic default and insolvency-related remedies. She emphasized the relevance of the Convention and the Space Protocol specifically, bearing in mind the exponential growth of the New Space industry and the interrelated need for access to finance due to the highly costly nature of all space activities. In addition, Veneziano described the unique structure of the Convention and its Protocols in international law. Both mechanisms are seeking to establish international registries for recording international interests. She stressed that the registration of an interest ensures the preservation of the creditor’s priority as all third parties looking to register an interest in the same asset are receiving respective notice. This ensures confidence building and reduces the costs of borrowing, leasing or lending finance for an asset. Veneziano concluded by referring to the current work of UNIDROIT towards finalizing the framework for the operation of the International Registry.

Marco Ferrazzani presented a paper entitled, “Space Activities in Europe through the Lenses of EU Competition Law”, submitted together with Ioanna Thoma. Ferrazzani first referred to a series of merger and acquisition cases reviewed by the DG Competition of the European Commission. He showed that DG Competition has overall been supportive to the restructuring processes within the European industrial landscape. Following that, he elaborated on EU competition law and ESA role in shaping European space activities. Ferrazzani clarified that ESA itself is not bound by EU competition law although most of its Member States are. Ferrazzani noted that ESA plays an important role in assuring fair competition and that this role was also consistently recognized by DG Competition. He explained that the ESA geo-return on the one hand and EU competition law on the other show regulatory cohesion and alignment between two legal systems. Ferrazzani then noted that many of the co-funded projects within ESA have the form of Public Private Partnerships. ESA rules for such co-funded programmes are set up in compliance with state aid rules. Ferrazzani concluded by emphasizing that the privatization of space activities will trigger the future application of EU competition law even more than ever before.

Frans G. von der Dunk outlined the special nature of the European Union, the law governing it as well as the special nature of space activities and of the European Space Agency. The presentation of his paper “The European Union and Space – Space for Competition?” emphasized that although the EU has an interest in space and the rules applicable to outer space activities, their application is not clear. One has to bear in mind that the EU consists of 28 still sovereign Member States with own interests and incentives. Von der Dunk made references to the baseline of the European legal order going back to the 1950s, over the Lisbon Treaty and the exclusive competences of the European organs therein. He then emphasized the *res communes omnium* nature of outer space, due to which no exercise of territorial jurisdiction is possible. Moreover, von der Dunk noted that the EU competition law regime was never meant for space activities, the only exception is the 1994 Satellite Directive. Nevertheless, Art.189 (2) TFEU provides for the application of competition law. Further, he listed eight national laws of EU Member States. However, he also highlighted three issues of concern. First, licensing as per national law is to be left untouched as some national laws address PPPs opportunities. Second, exceptions, such as important projects of common interest and global competition, are also recognized under EU law. Finally, he noted the role of the European Space Agency.

The presentations of Marco Ferrazzani and Frans G. von der Dunk were followed by a common Q&A session. Ferrazzani underlined in this context that contrary to the EU legal order, the ESA Convention explicitly gives preference to the European industry.

Brendan Cohen then presented his paper on “So, you want to buy a space company”. He touched upon the growing number of mergers and acquisitions in the space industry, and identified the due diligence phase as the first and most important stage of an acquisition or venture capital. This phase is then followed by the allocation of risks between the buyer and the seller. He underlined that venture capital investors typically do not have any remedy for a company’s breach of its representations, as the venture capitalist investment is immediately linked to the success or failure of a company. Some of the space sector specific risks, Cohen elaborated, are the environmental aspect as well as IP and cyber security issues. He also discussed regulatory matters, such as countries export control practices (e.g. ITAR, EAR), launch and re-entry licenses and insurances to cover a variety of risks associated with outer space activities. He concluded by indicating that the investment in space is rather growing than slowing down so that a competent legal and technical advice as well as careful due diligence are increasingly relevant, bearing in mind that the space sector poses unique challenges and risks.

Cécile Gaubert presented her paper “Insurance involvement on new space activities developments”. She noted that the insurance market currently experiences an over-capacity resulting in particularly low premium rates (e.g.

5% for a property damage insurance compared to previous 25%). Gaubert distinguished property damage insurance, which covers both launch and in-orbit insurance, from third party liability insurance. In the latter case, the coverage is limited in terms of duration and amount. She then listed numerous potential risks of damages. Regarding the space third party liability insurance, in some national regulations (France, UK, US) it is mandatory for operators to subscribe to such insurance, or to otherwise demonstrate its financial capacity to cover a liability claim. However, Gaubert identified some uncertainties in the context of on-orbit servicing, such as identification of the operator: whether it is the servicing satellite's operator or the customer who obliged to subscribe for third party liability insurance Gaubert then proposes to use known insurance concepts, such as corrective measures and the "salvage" provision, to develop new concepts allowing for favorable conditions to satellites using servicing satellites.

Patrick Neumann presented the paper also authored by **Thomas Green** and **Kent Grey** "Mitigation of anti-competitive behavior in telecommunication satellites and management of natural monopolies". He opened his presentation by explaining that the universe itself is large, however the useful parts of space are not. Neumann then clarified that certain orbits are particularly useful due to their altitude, inclination and/or eccentricity. Some of them are getting increasingly crowded. He clarified this issue on the example of the crowded Low Earth Orbit (LEO). He declared that the existing and planned (mega-)constellations and their use of certain orbits may lead to an effective monopolization. The presentation then went on to the current regulatory regime, consisting of the ITU Radio Regulations, the UN space treaties and debris mitigation guidelines. He emphasized that none of the current regimes effectively prevents a monopolization of orbits. The ITU Radio Regulations regime on frequencies should be expanded also to focus more on the use of orbits.

Mingyan Nie addressed space cooperation in Asia and its legal challenges in his paper "The Belt and Road (B&R) Initiative Provides Opportunities for China to Dominate Space Cooperation in Asia? – An Appraisal of Legal Challenges". Nie noted that the Asia-Pacific Space Cooperation Organization (APSCO), which focuses among others on industrial policy applies a "fair-return" principle. The separate Asia-Pacific Regional Space Agency Forum (APRSAF) developed from a "talking shop" to a regime that is capable to carry out cooperation programs. He then referred to the Japanese 2008 Basic Space Law and 2016 Space Activities Act and mentioned that, in contrast, China has still not implemented comprehensive national space legislation. However, the Chinese 2016 "White Paper" aims to support and guide non-governmental enterprises to participate in space activities. Nie then focused on the Belt and Road Space initiative. APSCO could become a platform for leading Asian space cooperation in contribution to the B&R space programs.

He concluded by noting the legal challenges, such as uncertainty of national legislation and questions regarding the co-sharing purpose under the legal framework of APSCO. He suggested that a space law framework is needed to uphold already existing fundamental legal principles.

Finally, **Ruth Pritchard-Kelly** presented her paper “To Fully Bridge the Digital Divide by 2027, Making Internet Access Available and Affordable for Everyone- the non-GSO constellation Response (Regulatory Best Practices)”, co-authored by Yvon Henri. She opened her presentation by explaining that the majority of the world has no internet coverage, this being of serious concern for developing countries and beyond. At the same time, there is an increasing demand for internet and data connectivity. Pritchard-Kelly suggested that regulators should encourage the rapid development of innovative services by supporting technology-neutral regulations, such as blanket licensing. Further, regulators need to promote competition as a driver of growth through the use of “open skies” policies. Pritchard-Kelly expressed her view that the existing market access rules in some countries are blocking new industries instead of encouraging them. In addition, she also mentioned that the transparency with regard to filing ITU applications to the Federal Communication Commission (FCC) is a competitive disadvantage in the U.S. Pritchard-Kelly made clear that OneWeb considers itself to be able to tackle the challenges of digital divide.

Session E7.3: Integrated space applications: EO, telecoms, navigation

Co-Chairs: Catherine Doldirina and Setsuko Aoki
Rapporteur: Andrea Capurso

During Session E7.3 the subjects of integrated space applications, Earth observation, telecoms and navigation were examined by ten presenting authors.

Dr. Maria Elena De Maestri opened the session with her paper “Big Data Flow from Space to the EU: Open Access and Open Dissemination Policy vs. the Common European Data Space”. The focus of her presentation was the importance of space technologies, data and services in the realization of EU policies. From the 2007 INSPIRE Directive to the 2018 Common European Space Data Communication, the EU has looked at space data as a way to implement the three fundamental freedoms of the Union. The General Data Protection Regulation (GDPR) aimed at integrating these two aspects, granting free movement of personal and non-personal data. At the same time, the speaker underlined how this digital freedom can be limited in view of other interests of the EU, functional to the Union’s fundamental freedoms. Due to the presence of different levels of regulation of space-derived data, the speaker concluded, there is today a need to rationalize the legal framework applicable to it within the European territory.

Dr. Catherine Doldirina, presenting her paper “Space Applications for Agricultural Purposes: Relevant Legal Framework”, highlighted how space data can be beneficial for farming purposes. Moreover, she examined how the international community is enabling the application of space services to agricultural processes and practices. Satellite Earth observation (EO) data alone or coupled with satellite technologies like navigation and positioning provide information on many aspects connected to agriculture. These applications can produce positive results under three axes of agricultural activities, identified by the speaker: compliance with farming requirements, sustainable development and aid to actual agricultural production activities. The legal norms relevant for these three axes, however, often are not applied properly. Lack of coordination and different needs of the actors involved result in inefficiencies and waste of potential. Hence, the speaker concluded suggesting a more sustainable balance in the priorities of the relevant institutions at international and national level to foster cooperation and regulatory coherence.

Dr. Ingo Baumann presented his paper “Legal Aspects of EO Services – Issues and Solutions”. After describing a recent shift in the market of EO data towards online platforms providing value-added services, he underlined the legal implications of this process. The use of e-commerce mechanisms does not pose new problems when it comes to operators of EO platforms, who have to comply with the same regulations. However, there are problematic aspects related to cloud computing, open source software and liability for third party content. These fairly new ways of providing services are just starting to be regulated and operators have to familiarize themselves with the rules applicable to their activities. At the end of the presentation, the speaker was asked his opinion on the requirement of consent from the subject of satellite observation. Considering the limited number of companies involved in geo-marketing – he answered – this is not yet a problem being addressed in a specific regulation.

The topic of the following presentation was connected to this question. The title of **Ms. Laura Keogh**’s paper was “Privacy Law Issues Raised by New Space Developments”. Her discourse was structured as a two-fold approach highlighting international and European law. If the first level only provides general principles on remote sensing, the EU has a different situation, especially after the entry into force of GDPR. The speaker started her analysis from the question whether ‘location’ can be considered personal data. She then proceeded with the analysis of the scope of application, the main principles contained in the GDPR and its interaction with space applications. The conclusion was that many areas of satellite services may be impacted by GDPR and, therefore, it is necessary that space operators take into serious consideration the laws concerning data protection.

“Legal Rights and Possibilities to Access Satellite Data for a Non-Member State of Space Community: Case of Republic of Serbia” was the paper presented by **Ms. Anja Nakarada Pecujlic** and co-authored with **Dr. Marko Pajovic**. Two considerations lied at the basis of the presentation: today’s societies are heavily dependent on space technologies and not every nation possesses indigenous space infrastructures. Therefore, they posed the following question: to what extent do developing countries have a right to receive data from spacefaring nations? The principles of international space law give little support in practice to developing countries, who inevitably fall back and cannot benefit from space data. The speakers, then, talked about Serbia as a perfect example of the problems that this lack of information can produce, forcing Serbia to be dependent on other states and unable to respond to national problems by the same means spacefaring nations do. In conclusion, a less restrictive approach to space data worldwide was suggested.

When it comes to satellite images, intellectual property is a relevant aspect. This was the object of **Ms. Mihoko Shintani**’s analysis, as developed in her “Intellectual Properties of the Satellite Images Analyzed by A.I.”. In the process of transforming raw data to valuable information by using artificial intelligence, different subjects can claim rights under intellectual property law. This can bring contentions on the attribution of copyright. Therefore, the speaker examined the interaction of space law, such as the UN Remote Sensing Principles, with IP rights connected to space data. The findings of her research led to recognize a need for attention in the way these issues are integrated in contracts put in place by the operators.

Mr. Daisuke Saisho presented his paper “Working with the Japanese New Remote Sensing Data Act”, a review of the Japanese law on remote sensing entered into force on November 15th, 2017. The speaker explained to the audience that the main purpose of the Act was to establish a clear certification regime based on a necessary license for the use of satellite remote sensing instruments. After a general excursus on the main obligations of license holders, he brought the focus to the safety management measures connected with this technology. JAXA, who was involved in the drafting of the Act, adopted internal regulations specifically addressing the use of remote sensing data. According to it, raw data is hardly distributed. One year after the entry into force of the Act, it is evident that it is well received by the operators, considering also that there has not been any violation so far. However – the speaker concluded – there is still room for improvement in the way these data are handled. A person from the audience asked clarifications on the Act’s geographical scope of application. To that question, the speaker answered by confirming its territorial nature, limited to remote sensing applications in Japan.

Prof. Gabriella Catalano Sgrosso, presenting her paper “Intellectual Property Protection, a Financial Aspect of the ISS”, shared her view on intellectual property rights (IPR) protection within the legal framework of space law, analyzing in particular the case of the International Space Station (ISS). She started by giving an overview of the relevant principles of space law and noticing how the increasing commercialization of outer space will increment the importance of IPR also in outer space. Her analysis focused on the lessons learned from the ISS. Being a multi-national place where astronauts of different nationalities conduct research and experiments, the speaker examined the problem of intellectual property rights with a comparative approach. Other than the Inter-Governmental Agreement (IGA) on which the ISS is based, the relevant laws of USA, Russia, Japan and the EU were inspected. In the end, it emerged that in the actual legal framework the possibility of conflicts of jurisdiction among Partner States is fairly high, especially in case of joint projects. Therefore, the speaker concluded that a harmonization of the various processes for patents and claims is desirable, suggesting the EU regime as a proper basis for a unified regulation of this matter at international level.

Next, **Prof. Mahulena Hofmann** presented the paper “Two Regimes Applicable”. Space resources utilization is only regulated by those principles of the UN legal framework that directly or indirectly affect this activity. Uncertainty prevails in this regime. However, another possible option is to look at the regulation used in the ITU for frequencies and orbit allocation. The speaker highlighted the strengths of the latter, considering the influence exercised by non-state actors and the anticipatory mechanism used, underlining coordination as the key factor. The same principles inspired another positive international initiative called The Hague Draft Building Blocks on Space Resources Utilization. The speaker concluded her presentation by using the example of Luxembourg – whose new draft law on space activities is currently under discussion – as a possible way of implementing the international principles on the use of space resources.

The last speaker of the session was **Mr. Jordi Sandalinas**, presenting his paper “Transferring Rights of Satellite Imagery and Data. Current Contract Practice and New Challenges”. The starting point was a distinction between raw, processed and analyzed data. Copyright and IPR are not satisfactory instruments for the protection of raw and processed data, but they can be for analyzed data. The speaker, at this point, analyzed the possible regulatory answers for protecting space-derived data creation and collection. His conclusion was that prevention is smarter than acting. That is true especially for online contracts related to geospatial data and imagery.

Once all speakers made their presentations, the floor was opened for a few questions. After a debate between authors and audience, the Co-Chairs thanked speakers and attendees, and adjourned the session.

Session E7.4: Space Law at Unispace +50: Consequences and Future Perspectives

Co-Chairs: Bernhard Schmidt-Tedd and Yun Zhao

Rapporteur: Antonino Salmeri, LL.M.

Session E7.4 consisted of various papers engaging with the development of space law at the 2018 Unispace +50 Conference on the occasion of the fiftieth anniversary of the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space.

Prof. Larry Martinez and Dr. Merve Ederm opened the session presenting their paper on “Unispace +60: Evolution of Long Term Sustainability Guidelines (LTS) into Customary Legal Norms”, which indicated UNCOPUOS LTS guidelines as “the rules of the road for sustainable use of outer space”. Moving from the case of the ITU graveyard orbit radio regulations, which enjoy a mere 30% compliance rate, the authors noted significant problems of compliance with current LTS guidelines. Given the low probability of a new treaty, Prof. Martinez and Dr. Ederm indicated as possible solution the evolution of the LTS guidelines into customary international law (CIL), which in Space 4.0 can be found as evidenced by national legislation and regulatory regimes. Then the authors categorized the guidelines according to the likelihood of attaining CIL status, pointing out that so far only the first set of them can be considered CIL, with explicit reference to guidelines 1, 2, 3, 4 and 28. While questioning UNCOPUOS suitability to elevate the remaining guidelines to CIL status, the authors concluded linking their work to that of Prof. Peter Martinez, Chair of the LTS Working Group, who already presented other “rules of the road” at the 2017 Space Security Symposium.

Following, Prof. Steven Freeland took the floor presenting his paper entitled “A Vital Artery or a Stent Needing Replacement? A Global Space Governance System Without the Outer Space Treaty”, that he co-authored with Prof. Ram Jakhu. The author started reminding that the Outer Space Treaty (OST) covered the need for international cooperation raised by the soviet launch of Sputnik 1 in 1957. The OST celebrated its 50th anniversary in 2017 and secured an outer space without war, thanks to its fundamental provisions laying down freedom of exploration, prohibition of appropriation and peaceful use. However, during those 50 years the world has changed, as the global rhetoric shifted from international “law” to international “rules”. Pragmatism took the lead of rule-making and interpretation, and States are increasingly withdrawing from internationally binding agreements they do not like anymore, as showed by the cases of the Human Right Council, the International Criminal Court, and the Paris Climate Change Agreement. As some argue that the OST is “outdated”, “inadequate” and even “inconvenient”, Prof. Freeland wondered whether the treaty is at risk of

being abandoned. While theoretically it is possible to withdraw from the OST with one year notice, the author doubts whether such move would be actually useful, since its fundamental provisions are considered to be customary international law. Thus, Prof. Freeland concluded that adherence to the OST is the only rational choice, as it provides a fundamental and organized framework for space activities, and called for responsible behavior in the utmost preservation of the humanity of space.

Next was the turn of Prof. Yun Zhao, co-chair of the session, that together with Dr. Shengli Jiang presented their paper on “Armed Conflict in Outer Space: International Humanitarian Law as a solution?”. Dr. Jiang started reminding that unfortunately armed conflict in space is no longer an illusion, and thus there is the need to research which law could govern it. As international space law does not have any specific rules for armed conflict in outer space, according to Article III OST it is worth looking at international law. Moving from the notion of “use of force” in public international law (PIL), Dr. Zhao wondered whether the use of ground based and space based weapons in armed conflict in outer space constitutes use of force under PIL. Then, Prof. Zhao took the floor discussing the exercise of self-defense as an exception to the prohibition of use of force, reminding that no international rules have denied the exercise of self-defense in outer space. Having clarified the applicability of PIL, the authors then considered the application of international humanitarian law to armed conflict in outer space. Again, in the absence of specific rules prohibiting such possibility, the authors concluded that it is safe to assume that general principles of international humanitarian law, such as those of limitation, proportionality and distinction between militaries and civilians, are applicable to armed conflict in outer space.

The 4th presentation was delivered by Dr. Martina Smuclerova, that discussed her paper on “Legal Perspectives for the Further Development of the Five UN Treaties on Outer Space in Light of Rising Multistakeholderism”. The author started reminding the new challenges coming from UNISPACE +50, with special focus on the effectiveness of the current space legal regime. Accordingly, Dr. Smuclerova presented some legal perspectives on adjustments, supersession or resistance of the UN treaties. First, in the impossibility to make formal amendments, adjustments can be ensured via further elaboration and complementation on subsidiary levels, as well as via other regulatory techniques such as specialized treaties, national law, and soft law. While specialized treaties are less likely in the current context, a significant contribution can be given by soft law as catalyzer of international custom and harmonizer of national laws. At the same time, soft law can play a role as long as it doesn’t contradict the existing legal rules, and it is functional as long as it is uniformly interpreted. Moving to interpretation, the author reminded first that modern interpretation should remain in line with the letter and original purpose, and secondly that a multilateral treaty is not an object for a single State’s unilateral interpretation. Dr. Smuclerova then

concluded that while adaptation of the UN treaties is inevitable, it also brings the risk of fragmentation, challenging the unity and coherence of international space law, that we should then aim to preserve in the process.

The 5th speaker was Mr. Dennis O' Brien, presenting his paper on "UNISPACE +50: Time of the Moon Treaty". The author started underlining the most significant concerns usually raised against the Moon Agreement (MA) also seen in the light of the UNCLOS mining regime. Inter alia, Mr. O' Brien discussed intellectual property, the establishment of international fees, royalties or taxes, the weaknesses of a global decision making process and the challenges of nationalism. To such issues, the author replied that the international community should fight war, violence and neglect, as they destroy hope, create cynicism and crush the spirit. According to Mr. O' Brien, the mission is to restore the hope created in 1968, when our view of the world changed, because of the Apollo astronauts watching it from the Moon, and thus to spread again passion about space. To such end, the author concluded that current State Parties to the MA must begin the process of drafting an implementation agreement, create a framework of subsequent laws and invite non-members to join or be left behind.

The 6th presentation was delivered by Mr. Alexander Soucek and Ms. Jenni Tapio, who presented their paper on "Normative References to Non-Legally Binding Instruments in National Space Laws". Moving from a hypothetical quote from the imaginary National Space Act of *Exemplia*, according to which "the operator shall adhere to internationally recognized guidelines and standards for space debris mitigation", the authors recalled a conversation they had on the vagueness of what is "internationally recognized". Accordingly, the presenters discussed unspecific normative references as a fundamental obstacle in measuring compliance with national and international law. In the given example, for instance, there are three different "internationally recognized guidelines on space debris mitigation": the 2002 SDM guidelines developed by the Inter-Agency Space Debris Coordination Committee (IADC), the 2007 SDM guidelines approved by the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS), and finally the SDM standards approved in 2010 by the International Organization for Standardization (ISO). Furthermore, analyzing the rules related to "debris release" and "spacecraft break-up", the two authors showed that the three documents are quite different from each other, thus further complicating the compliance question also in light of Article VI OST. On this note, the authors favored a role for the executive power, through the individual act of authorization/supervision, as the effective link between the State's behavioral guidance and the operator's behavioral response. In conclusion, according to Mr. Soucek and Ms. Tapio, while unspecific normative referral in laws is probably inevitable in national space legislation, such laws should also make sure that any non-specificity will ultimately be

resolved at the executive level, for the law to truly manage the expectations of those designing it – and those being submitted to it.

The 7th presenter was Ms. Irina Chernykh, who discussed her paper on “International Legal Aspects on Sustainable Development of Outer Space Activities: Combine Safety Effectiveness in the Long-Term”. The author started introducing the LTS guidelines for outer space activities as enshrined in multiple UN documents, and assessing their effectiveness. Then, Ms. Chernykh moved to the challenges related to space debris and space traffic management, illustrating the various soft law documents dedicated to them and figuring also a possible role for ICAO. Following, the author discussed the issues related to the differentiation between launching and registering states, as again dealt in many different UN documents. Pursuant to this situation, according to Ms. Chernykh, current international space law is becoming too fragmented and thus is at risk to lose its effectiveness. Consequently, the author concluded suggesting a new UN Convention on Space Law based on the UNCLOS model, with the purpose of updating the existing space treaties, consolidating the steps taken in soft law documents and unifying the existing legal rules of international space law.

At this stage, pursuant to the initiative of co-chair Prof. Bernhard Schmidt-Tedd, the session was paused for discussing some questions. *Inter alia*, it was discussed how to ensure precise compliance, what happens if non-compliance is proven and how far an authority can go in interpreting the SDM, with interventions from many of the authors. Following, Prof. Schmidt-Tedd handed out the main direction of the session to Prof. Yun Zhao and the floor was given to the next presenter.

The 8th presentation was delivered by Dr. Annette Froehlich, who illustrated her paper on “A Fresh View on the Outer Space Treaty and on the Evaluation of the Post-Agenda 2030 goals”. Dr. Froehlich started reminding the thematic priorities for UNISPACE+50 (i.e. space governance, capacity building and space for sustainable development) and comparing them to the topic presented to the European Space Policy Institute (ESPI) by a group of young scholars specifically asked to indicate the most sensitive issues in space law. In particular, attention has been drawn to the following topics: environmental protection, how to prevent militarization, aspects around human settlements to avoid old colonial mistakes, the use of robots, and issues around creating new societies in space. Then, the author discussed each of those issues, underlining the impressions expressed by these young scholars, that the ESPI has then collected in a book. *Inter alia*, while environmental protection has been considered to have high priority, concerns were expressed about the adequacy of the OST to cover UN peacekeeping missions. Lastly, Dr. Froehlich concluded arguing the need to expand the OST with fundamental principles of governance for human settlements and the establishment of a specialized supranational judicial body open to both public and private actors.

The 9th presenter was Mr. Edward Burger, who discussed his paper about “The Promotion of (Space-Based) Telemedicine via UNISPACE +50”. First the author defined telemedicine, underlining its importance in contributing to sustainable human presence in outer space. Further to that, Mr. Burger illustrated how relevant is telemedicine becoming on a daily medical basis, with extensive on-Earth applications. Following, Mr. Burger went through the developments on space medicine and telemedicine in the UN legislation, first from 1980s to 2014 and then since 2014 onwards. From such analysis, Mr. Burger concluded that the UN has been giving increasing priority to research and application of telemedicine technologies, as they can play an essential part in the common development effort.

The 10th presentation was given by Prof. Xiaodan Wu on “Reflections on the International Legal Framework Governing Re-Entry of Space Objects”. The author started with a selected list of reentries, some of them controlled and some of them uncontrolled, from the 2001 MIR of the Russian Federation to the 2018 Chinese Tiangong-1. Then, Prof. Wu pointed out that space law has established a unique state responsibility regime to provide effective rights to individual victims, in a victim oriented and environment-friendly framework. On this note, while the re-entry process should be transparent, the author noted that there is a loose notification duty: to whom the information should be disclosed, and to what degree? Nevertheless, from Cosmos 954 to BeppoSAX and Tiangong-1, practice is evolving towards more openness. Still, according to Prof. Wu the degree of this extension is quite problematic as sometimes it involves sensitive data. Further to that, Prof. Wu analyzed jurisdiction and control issues, alongside the removal of re-entering space objects in connection with return of personnel and post-entry clean-up operation. On liability and compensation, the author noted that there is a limited definition of damage in Article 1 of the Liability Convention, which also does not provide any definition of fault nor a fixed standard for determining it. Thus, also because technology is now mature enough for controlled re-entries, Prof. Wu concluded pointing out the need to improve the current legal framework as it is uncertain, fragmented and not specific. As state practice is uneven, non-binding standards and guidelines can be a good starting point.

The 11th presenter was Mr. Kazushi Kobata, who illustrated his paper on “Evolving Norms on Pre-Launch Notifications of Space Launch Vehicles: Historical Perspective in the Context of UNISPACE+50 Thematic Priority Three”. The author started introducing thematic priority three as dedicated to enhancing the exchange of information on space objects and events, as supported by the LTS guidelines, by the work of the Group of Governmental Expert (GGE) on Transparency and Confidence Building Mechanisms (TBCM) in outer space and finally by the Draft International Code of Conduct (ICOC) for activities in outer space. In such context, Mr. Kobata investigated how and why the LTS guidelines evolved through the fulfillment

of thematic priority three. To such end, the author recalled other attempts to enhance the exchange of information on space objects and events than the LTS guidelines. *Inter alia*, Mr. Kobata recalled the attempt, proposed by Canada, to expand the Registration Convention so that it would require more detailed and timely information concerning the function of a satellite for arms control purposes. Further to that, the author also mentioned France's attempt to introduce the obligation to transmit pre-launch notifications of launches to an international center set up under the auspices of the UN. Unfortunately, both attempts failed to convince the United States and thus consensus was not reached. On the contrary, the LTS guidelines managed to enhance the practice of registering space objects, evolving from merely assuring safety to providing more detailed and timely information for registration, as also supported by State practice. Ultimately, Mr. Kobata concluded praising the importance of LTS guidelines as they moved the focus of the discussion from arms control to space safety, thus increasing the possibility to reach consensus.

The 12th presentation was delivered by Ms. Kang Duan, on "Belt and Road' Space Information Corridor: Opportunities and Challenges from Legal Perspectives". The author started introducing the "Belt and Road" initiative, raised by Chinese President Xi Jinping in 2013 in order to address existing infrastructure gaps and accelerate economic growth across the Asia Pacific area and Central-Eastern Europe. Since its establishment, the initiative has been integrated by an Action Plan in 2015 and Guiding Opinions in 2016. Ms. Duan then illustrated that the Chinese government has decided to focus on engaging the private sector and establishing fixed assets investments, with a role also for foreign capitals (although with some prohibition related to sensitive areas, such as broadcasting satellites). Further to that, Ms. Duan showed how the B&R initiative takes into account the importance of remote sensing, with particular focus on Data Policies (as exemplified by the CHEOS data policies), Ground Station Infrastructure and Information Security & Privacy Protection. Lastly, the author discussed how the B&R program is also about navigation issues, insofar as it is meant to enhance China's BeiDou Global Navigation Satellite System so that it can cover all basic services across B&R countries by the end of 2018 and then reach global coverage by the year 2020. Ms. Duan then concluded underlining the global dimension of the B&R initiative, as it represents essentially an international cooperation program on monumental scale, meant not to substitute but to further enhance existing regional cooperation frameworks. This cooperative dimension is confirmed by dispute settlement mechanisms for B&R, that are focused on consultation between governments and arbitration with private entities. In this respect, China is eager to support all concrete programs, share common experiences and harmonize different legislations.

Last and 13th presenter was Prof. Jose Monserrat Filho, who illustrated his paper entitled "International Cooperation in Space Is Essential in Our Time".

Prof. Monserrat's talk focused on multilateral cooperation as absolutely indispensable in the modern era, as also recalled in all fundamental documents of international law, such as the UN Charter and the OST. The author illustrated how only international cooperation can effectively prevent global disasters and how complete nuclear disarmament is an essential measure to such end. In particular, Prof. Monserrat insisted on the urgency to intensify strong, close cooperation in the exploration and use of outer space, praising the case of 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). In the author's view, space law should serve and protect all nations and should be the closest link among them. Accordingly, Prof. Monserrat concluded calling for a closer involvement of developing countries in decision making processes and reminding the importance of equity and truthfulness as essential towards a truly global cooperation. Finally, Prof. Schmidt-Tedd and Prof. Zhao thanked the presenters and the audience for their time and declared the session officially closed.

Session E7.5: The relationship between space law and cyberlaw, and other recent developments in space law

Co-Chairs: Prof. Larry Martinez and Prof. Stephan Hobe

Rapporteur: Simona Spassova

This panel invited submissions on a range of topics focusing on the policy and legal interactions between telecommunications law and outer space law. Papers addressed the following issues: the technical architecture of cyber space; existence of a (self-contained) specific legal regime for cyber space; entities responsible to regulate cyber space; legal aspects of cyber security as well as issues such as AI and space activities, and regulating space resource utilization. The panel was divided into two main parts. The first one focused on recent developments in space law and the second one was more closely dedicated to the delicate relationship between space law and the law of cyber space.

The session was introduced with a presentation on artificial intelligence and state responsibility by Mr. George Anthony Long. The talk recognized that AI may present a potential for ensuring the cyber and physical security of space assets. However, the nature of these technologies also poses a conundrum when it comes to state responsibility and a State's obligation to retain control. It was pointed out that some jurisdictions in the United States are contemplating laws which mandate human ability to override or otherwise intervene in decision making by artificial intelligence in certain circumstances. Currently, Article III of the Liability Convention serves a similar purpose by imposing liability based on a State's fault or fault of persons for whom the State is responsible. Furthermore, using AI objects does

not avoid accountability for damage or harm caused in outer space by a decision made and implemented by an intelligent space object - given the duty of authorization and continued supervision imposed by Outer Space Treaty Article VI.

Prof. Henry Hertzfeld emphasized the fragmentation of international law, defined by the development of sets of rules pertaining to specific subject areas that may claim autonomy from principles of general international law – such as the environment, energy, resource availability, migration, health, and the proliferation of weapons of mass destruction. Space law as well is unique and may be considered one of the fragmented areas of international law. But within this specific body of law as well – fragmentation is also apparent, including issues such as liability, property rights, debris and environmental harm. Different on-orbit space activities such as satellite servicing, exploiting resources, and removing debris highlight the types of space activities with many similar legal concerns, but which may result in different rules in different nations and even for different rules within a nation. Hence, the talk recommended invoking the treaty clauses that clearly call for changes in interpretation at the appropriate time as an acknowledgement that times have changed and will continue to evolve. What needs to be done is to develop new protocols for the conditions that are not dealt with previously and to allow for future realities as space technology advances and private entities expand their capabilities in space. These exciting future capabilities also demand different approaches to the risks that inevitably would follow.

The following presentation by Prof. Irmgard Marboe focused on space resources and the need for a refined legal definition. The title of the talk quite clearly summarizes the essence of the presentation - to examine how the terms ‘space resource’ and ‘celestial body’, as used in the UN space treaties, should and could be defined in order to provide better guidance to national legislators and international fora concerned with the formulation of recommendations on space resources governance. In addition to Articles 31 and 32 of the Vienna Convention on the Law of Treaties, approaches and definitions used in practice by scientists, such as astronomers, astrophysicists, and engineers, were taken into account. Prof. Marboe also analysed approaches within national acts dealing with space resources and concluded with a recommendation for a multilateral approach to clarify the definition of celestial bodies and space resource, making a distinction between solar system bodies within and outside the scope of the rules on celestial bodies, or between asteroid resources and space resources.

The session continued with a presentation by Rada Popova and Stephan Hobe on the Moon village and the related potential legal ramifications. The Moon Village was announced in 2016 by ESA Director Jan Wörner - to be used for a multiplicity of experiments of medical, architectural, pharmaceutical, astrophysical and life-sciences nature. The analysis demonstrated the compatibility of these activities with international space

law as well as which kind of legal developments of space law may be aimed at in order to make future activities of the Moon Village successful. The vision of the Moon Village, as it has been announced, does not contradict any of the provisions settled in the legal framework for human activities in outer space. The existing legal framework allows the use of the Moon and any (non-military) stations thereon and would lead to the acquiring of limited property rights with regard to inventions. However, the appropriation of any territory on the Moon is fundamentally denied. Experiments must be conducted within the specific limitations imposed by space law. The paper further pointed out, as well, that with regard to the legal status of persons on the Moon and the duties and rights resulting therefrom, international space law possesses the function of *lex specialis* vis à vis general human rights.

The next presentation was delivered by Prof. Roy Balleste, who focused on tackling the legal challenges associated with responding to cyberattacks in outer space. The talk considered the expansion of human conflicts into outer space and the need to temper these. Acts of aggression in cyberspace are elusive and so far have escaped the classification that would label them ‘actions within the domain of war.’ The author suggests that the basic criterion by which stakeholders must be guided is the recognition that for a profitable and secure management of satellite technologies and space exploration, there needs to be a definition for outer space cybersecurity risks. The beginning of the resolution as proposed comprises of two rules of engagement applicable to cyber operations in outer space. Firstly, the military use of cyberspace in outer space is not contrary to peaceful purposes, but such use should be non-aggressive or may not adversely affect another State. This rule may be suspended among belligerent States during periods of armed conflict. And secondly, a State not involved in a conflict that engages in cyber operations directed to disable or destroy space objects that belong to another State is in violation of Article III of the OST, if it knowingly allows its territory to be used for acts contrary to the rights of the other State. An overriding preference must certainly include rules made for the protection of the peaceful enjoyment of outer space—activities that are now in danger of suffering the effects of cyberattacks.

This first part of the session was concluded with a presentation by Ms. Dimitra Stefoudi on the work of the Hague International Space Resources Governance Working Group. As in previous years, this third Progress Report provided an update on the developments of the Working Group. It focused on the results of the last meeting of its first phase and provided an overview of the expected activities in its second phase from 2018-2019. Ms. Stefoudi outlined the major milestone achieved at the end of the first phase, namely the “Draft Building Blocks for the Development of an International Framework on Space Resource Activities”. These are to serve as a basis for negotiations on a future governance system for the use of space resources and were widely made available in order to gather feedback from the

international community. During the second phase, the Working Group established a technical panel. Lastly, the paper provides insight into the prospects for a successful conclusion of the activities of the Working Group and the way forward toward an international framework for the governance of space resources. The speaker further encouraged the audience to provide feedback on the Draft Building Blocks before the team proceeds with updating and completing them.

The second part of the session was more exclusively dedicated to cyber activities and the problematics of regulating and legislating the cyberspace environment. The first presentation, by Rada Popova and Stephan Hobe, hence laid the foundation for a further discussion on the subject. It dealt with the applicability of space law to cyber activities and the possibility of a cyber legal regime. The speaker began with an introduction of this new dimension of human activities which takes place in a common space, in an increasingly complex and fluid networks, and illustrated its direct relationship to space operations. While it is clear that cyber attacks constitute a threat for space operations, the legal rules applicable to cyber operations have still to be determined as well as the measures to address the consequences of cyber threats to the space infrastructure. The authors conclude that in order to come up with a regulation for cyber activities, it is vitally important to base any legal considerations on a fundamental understanding of the technical infrastructure and the complexity of cyber threats.

Stefan Kaiser approached the legal dimension of cyber activities from a more general legal perspective and stressed upon the fragmented nature of the international public order in relation to cyber activities. Hence, when it comes to definitions, in light of a more holistic cyber regime, he proposed the use of the term 'cyber activities' instead of 'cyber space', thus creating the link to human activities. The speaker also pointed out that the public order for cyber activities should foremost be rooted in the right to undertake cyber activities and to use cyber infrastructure in a fair and non-discriminatory manner. He mentioned that a number of principles of public international law are applicable to cyber operations, such as the principle of peaceful purposes, the principle of benefit and interest of all countries, non-discrimination, as well as promoting international cooperation and understanding. Within this context, it was pointed out that cyber security is the 'the flip side' of the exercise of this freedom of cyber activities. When it comes to attribution, however, cyber forensics as well as legal conditions need to be further developed, so that States can fulfil their role in cyber security and attribution may be effective. Lastly, the speaker concluded that even though we see a multi-stakeholder governance of the internet, in the existing multi-stakeholder environment, States need to overcome their *laissez-faire* posture and actively create a counter-balance to other actors. The increasing role of cyber activities require States to adjust their structures, rules and procedures in the legislative, executive and judicial branches.

Prof. Setsuko Aoki's presentation differentiated between five categories of malicious cyber activities against space assets in order to assess to what extent the existing international telecommunications law and space law address them. These categories included jamming, hijacking, hacking, spoofing, and robbing the control over the telemetry, tracking and control (TTC) of a satellite. The author mentioned some significant cases of such activities – in Iran, Sri Lanka, China and examined these in light of the ITU Radio Regulations as well as the UN treaties on outer space and the customary international law of responsibility. The conclusions arrived at are as follow. First the ITU legal regime may address such cyber-attacks, but it is not sufficient if an attack is carried out by a sovereign State. Secondly, ASAT through cyber-attacks should be regarded as an activity in outer space and addressed in the consultation and due regard obligations in Article IX of the Outer Space Treaty as well as Article VI thereof. Third, space law studies on the nature and function of jurisdiction and control should be furthered so that a victim State knows what to do when jurisdiction is infringed. Lastly, the problems of damage by cyber-attacks and what constitutes intervention and use of force should be studied further to ensure the peaceful uses of outer space.

The main question examined by Prof. Fabio Tronchetti's presentation was: How do *jus ad bellum* and *jus in bello* rules apply to cyber offensive actions against space objects and their related ground facilities. For a wholesome answer to this question, the author adopted a double-step process: first, by understanding cyber technologies and their capability to affect space systems; second, by adapting public international law principles to the technological, political, and legal reality of our times. Cyber-attacks against space objects are not a remote option. Considering the political and military consequences of a direct strike involving conventional weapons against satellites, an attack through cyber means constitute a valid and advantageous option for an attacker. While it is important that States develop mechanisms to protect their space assets against cyber-attack, it is would also be necessary to address the legal issues associated with the modalities to respond to such attacks. The presentation demonstrated how the existing rules regulating the use of force are not suited to govern responses to cyber-attacks. Particularly problematic is the question of the use of conventional, destructive, weapons to respond to a cyber-attack. While certain countries and scholars fully support this option, its legality is debatable and largely dependent on several factors that are essential to enable the response to meet, inter alia, the criteria of necessity and proportionality.

Dr. P.J. Blount's talk examined the delicate subject of cyber operations against satellites and how these are tackled within the current legal and strategic framework of international activities. The presentation started by noting that ASAT capabilities in general have been developed for a long time, but there has not been a demonstrated deployment. While space law has no

affirmative prohibition on the use of ASAT weapons, states have generally shown restraint in the use of these weapons based on the perceived aftereffects, such as debris creation, that result from their use. These aftereffects could have legal and strategic implications that stay in the hand of the state. Network technologies, however, can minimize these aftereffects in such a way that they may no longer be an unacceptable legal and strategic risk for states. The world has already seen this in the terrestrial sphere as states have begun to engage in new forms of intervention via cyberspace. The presentation established the nature of emerging cyber-operations and how these can be used in space. It analysed how cyber operations fit within the framework of space law and the law of armed conflict, and why they are changing the nature of space security. The discussion concluded with suggestions on how the space security regime can be strengthened in light of these changing circumstances.

The next presentation was given by Simona Spassova and Federico Bergamasco on the extent to which cyberattacks fit within the ITU's definition of "harmful interference (HI)." The first part of the presentation dealt with the definitional side of the topic on the ITU and cybersecurity. The speakers emphasized that the ITU has a number of technical initiatives that impact on cybersecurity and the organization's legal documents even provide for a formal definition of the concept. However, most of these initiatives do not have direct implication to satellite operations in specific. Hence, the second part of the presentation asked the question: Could the ITU radio regulations pertaining to the radiofrequency spectrum and prohibiting harmful interference be applicable to cyber attacks? The analysis pointed out the need for a technical understanding of the two phenomena and concluded that yes, theoretically it is possible for HI and a cyber attack to coincide, but practically, this is a very unlikely and improbable scenario. In conclusion, the speakers pointed out the need for a relevant and coherent definition of what precisely constitutes a 'cyber attack' and recommended that this definition should consider all the possible approaches and variables: 1) actual means of the attack, 2) specific target, 3) effects/consequences and 4) intent.

The session concluded with a talk by Ms. Dimitra Stefoudi on cybersecurity laws that aim at protecting against unauthorised access to data and interference threats against space systems. More specifically, the presentation assessed whether the existing cybersecurity regulations are pertinent to the protection of data stored on board satellites in outer space and on the ground. It referred to the EU Directive on Security of Network and Information Systems (NIS Directive), the US Internet of Things Cybersecurity Improvement Act (IoT Cybersecurity Act), and the Tallinn Manual on the International Law Applicable to Cyber Operations (Tallinn Manual 2.0), so as to assess their connection to the current methods of data storage. The presentation examined the relevance of the laws in terms of their scope when it comes to subject

matter, but also territorial sovereignty. An example was given with the storage on board a satellite of data received from another satellite, without the intervention of a ground facility in these transmissions. In this event, the application of these laws, whether national or international, could be debated as irrelevant or redundant. Applying the element of responsibility over a registered space object, pursuant to the Space treaties, however, could also prove problematic. Hence, the presentation concluded by acknowledging that cybersecurity remains a complicated matter in terms of regulation, especially with regard to space data and space activities in general. The existing laws might find application, depending on the way in which their content is interpreted but it is questionable whether the basic definitions on the subject of regulation cover space systems to the extent necessary.

Session E7.7-B3.8: Legal framework for collaborative space activities - New ways of launching (micro-launching) and large constellation microsats (Joint IAF/IISL session)

Co-Chairs: Philippe Clerc and Tony Azzarelli

Rapporteur: Kamlesh Brocard

After introduction by the co-Chairs, Attila Matas gave the first presentation entitled “The ITU space regulation - a key element to access space”. Mr. Matas presented an overview of the existing regulatory procedures of the ITU related to: mega-constellations (also referred to as non-GSO Fixed satellite service systems “FSS”), non-GSO small satellites systems, and the developments in the studies related to these systems for the next WRC-19. The ITU Radio Regulations (RR) contain no exact regulatory definition related to mega-constellations, and Mr. Matas explained that there is a wide variation in such constellations, be it regarding the number of satellites, orbital planes or compatibility with different subsystems. The Bringing into Use aspect (BiU) is crucial for bringing a satellite network into use as the regulatory time-limit is seven years following the advance publication by the ITU of the frequency assignment. The recent filings of multiple mega-constellations with thousands of satellites calls into question the BiU requirement: it is simply unrealistic to have all the satellites deployed within the 7-year period. One of the conclusions of the corresponding Working Group is to implement a milestone-based approach for the deployment of mega-constellations in specific bands and services. Mr. Matas recalled that at the WRC-15, a new Resolution 659 was adopted which for the first time included the term “short duration mission”, inviting the ITU to integrate the technical and technological implications for the space operation service for the growing number of satellites with short durations missions. In view of the evolution in the sector, a simplified regulator regime for the advance publication, notification and recording procedures for mega-constellations

with short duration missions is required. The new draft Resolution “Simplified regulatory regime for non-GSO SDM satellite systems” contains important aspects which seek to address the new challenges presented by the diverse range of actors, from academic institutions to developing countries, and the range of services provided by the satellite systems.

The second presentation was by Harrison Kearby and bore the title of ““Leviathan Lite” - Towards a Global Stewardship Organization for Space Domain Awareness, Conduct, and Remediation”. Mr. Kearby put forward the growing problem of space debris in orbit - making reference also to the Kessler effect – with the likelihood of further collisions producing an exponential growth in debris. Lack of best practices by individual States for a sustainable use of space together with the advent of large satellite constellations mean that the Earth orbits would quickly become unusable, making the space business even more risky. Although a mix of national and regional organizations are trying to solve the debris problem via research, guidelines or best practices, the question of overseeing compliance is not resolved. A new proposition put forward by Mr. Kearby is that of private regulation via insurers and regulators. Such a regime for space traffic management and space debris could lead to increased compliance. A number of challenges still remain, and stakeholder consultation is key to finding the best approaches.

The third presentation was by Helena Correia Mendonça on “A new approach to national laws aimed at encouraging small satellites’ space activities”. Ms. Mendonça recalled that the body of international space law is primarily geared towards State activities and national authorization and supervision. While existing national space legislation seek to manage the associated obligations and risks, the growing privatization and commercialization of the sector, together with the progress in R&D and the launch of mega-constellations create additional regulatory needs. The role of national legislation covering private space activities - whether through a traditional or non-traditional approach (e.g. Luxembourg and the Isle of Man) – must provide a complete framework promoting space activities. There are different implementing models for a national framework, with the common elements being promotion of private activity as well as the incorporation of (inter)national regulatory requirements and specificities of the space business. Ms. Mendonça presented the Portuguese Space Bill approved in February 2018, which includes innovative solutions aimed at promoting private space activities in Portugal. Some elements are as follows: a streamlined mechanism for authorization of space operations, licensing requirement for space operations only, special and simplified procedure for low-risk space activities related to research, educational or testing purposes, as well as a voluntary pre-qualification regime. In general, involving the private stakeholders at a higher level of leadership or co-leadership when developing the regulatory way forward as well as being inclusive of related

legal frameworks such as import/export, Tax or IP, create legal certainty while empowering the private sector. Ms. Mendonça concluded that such an approach would be effective in promoting private activities and be appropriate to respond to current and new trends, especially for the launch of small satellites.

The fourth presentation was by Quentin Verspieren, on “The Principle of Non-Appropriation and the Exclusive Uses of LEO by Large Satellite Constellations”. Mr. Verspieren opened his presentation with a reminder that Low Earth Orbit (LEO) is already the most populated orbit for space applications. New projects for mega-constellations enabled by technological progress challenge not only the established space business models, but also the existing legal norms: the corresponding regulatory framework under the ITU is being reconsidered and the IADC Space Debris Mitigation Guidelines in LEO are considered as “insufficient and no apparent trend towards a better implementation is observed”, compared to GEO. With the number of satellites and debris already present, it is the sustainability of the LEO environment which is challenged. Supported by disruptive technologies as well as lower manufacturing and launch costs, encouraging economies of scale and higher coverage through a larger number of satellites, Large Satellite Constellations (LSC) prove an appealing business model. Radio frequencies and associated orbits are considered limited natural resources and LSC make an “almost exclusive use of the selected orbits”. Mr. Verspieren argued that as such, the existing legal principles of non-interference or of non-appropriation – by means of exclusive occupation - are violated by LSC. Exclusive use does bring about further technical and regulatory challenges: there is a need for international regulations or code of conduct to ensure the sustainable use of LEO and avoid the violation of the non-appropriation principle by LSC. These could be developed under the aegis of ITU or COPUOS.

This was followed by Gilles Doucet’s presentation on “Outer Space SARPs: A Step Towards Harmonization of National Regulations for the Enhancement of Sustainability of the Space Environment”. With a look to the context in which the space law treaties were developed, Mr. Doucet stressed that the relatively recent and rapid growth of novel commercial ventures highlights the deficiencies of governance in outer space. The myriad of activities already conducted or envisaged require that Standards and Recommended Practices be developed. He argued that the soft law measures are insufficient to adequately ensure the sustainability of the outer space environment. Citing international safety regulations in other domains, namely marine and air, he proposed an international governance regime for Outer Space SARPs, based on the Chicago Convention model, with the potential subjects to be addressed. SARPs would also promote the harmonization of national space regulations and would potentially simplify international licensing procedures.

The sixth presentation of the session was by Ntorina Antoni on the “Legal and Policy Perspectives on Civil-Military Cooperation for the establishment of Space Traffic Management”. Ms. Antoni highlighted that the concept of Space Traffic Management (STM) has hence been brought to the forefront of legal and regulatory discussions and provided a background of the evolution of the concept since the 1980s. The dynamic technological developments within the space sector present growing challenges to space actors, be it concerning launch, telecommunications, Earth observation or navigation services. This, coupled with the substantial increase in expenditure in defence and security space programs in various countries and the ensuing increase in the number of operational satellites and proliferation of space debris in a congested orbital space environment bear consequences for the safety of space operations. The civil-military nexus in space activities gives rise to a significant regulatory challenge for the establishment of a comprehensive STM system. Although the objective of the STM concept matches the safe and sustainable use of space outlined in the Outer Space Treaty, the diverging interests restrict the level of cooperation which is fundamental to such a system. International cooperation is key and the Draft Resolution of Space2030 presented at UNISPACE+50 stresses this need. Ms. Antoni proceeded with a comparative of STM with the traffic management regimes applicable to Air, Sea and Frequency, stressing for instance that Air Traffic Management is a co-existence of civil and military uses, with the timely exchange of information between military and civil users being key. She concluded with the view that as with the development, although sometimes fragmented, of such traffic regimes, the common element is the desirability of ensuring safe traffic for a sustainable use of outer space. The negotiations and development of an STM regime have much to draw upon from the roles and experience of other organisations such as the ICAO, IMO and ITU and their successes based on the international cooperation.

The seventh presentation, which was jointly made by Olga Stelmakh-Drescher, Ian Christenson and Joerg Kreisel, is entitled “Commercial OOS and Its Future: Policy and Legal Issues Beyond Life Extension”. The presenters started by highlighting that currently the private sector is fully engaged in deploying technical and market innovations which make, inter alia, on-orbit servicing (OOS) and eventually on-orbit assembly (OOA) of satellites a reality. These new concepts and ways of utilizing satellites and manufacturing spacecraft in general bring significant changes to the traditional methods of conducting space business, and more particularly, require amendments at the policy and regulatory levels. OOS enables operators to provide repair services, correct on-orbit anomalies or extend the lifetime of traditional satellites, which is also relevant when it comes to space debris mitigation measures. The presenters pointed out the various aspects which need to be addressed so that the political, legal and commercial factors are aligned to provide a higher degree of legal certainty to the industry. These

aspects include an agreement on specific technical and engineering standards, rules for information-sharing between servicing companies, clients and governments, as well as transparency mechanisms to reduce misconceptions and concerns about dual-use nature. Specific mention was made of CONFERS (Consortium for Execution of Rendezvous and Servicing Operations) which seeks to leverage best practices and standards from government and industry. CONFERS also aims to fulfil an industry advocacy role for the emerging satellite segment. The potential for OOS-related technologies to serve as an economic driver was highlighted. This potential, however, will develop only if the boundary legal and policy conditions are deemed permissive by the industry and provide them certainty.

The eighth and final presentation entitled “Regulatory aspects in launch services contracts for micro-satellites - successful docking in legal space” was made by Kang Duan. Kang Duan addressed space procurement contracts for micro-satellites launches and how these would need to be tailored. Launch service contracts are concluded incorporating the basic tenets of the international treaties and the specificities of the applicable national legislation. The growing number of non-governmental participants together with the various mega-constellations of micro-satellites mean that the industry demands and regulatory needs differ from the more traditional contracts for a dedicated mission: different contractual needs arise relating for instance to technical standards, liability, or indemnification. Kang Duan proceeded with reminding how international space law deals with responsibility, liability and registration before highlighting the extent to which provisions of national space legislation must complement requirements for *inter alia* third party liability, risk management, the different levels of insurance, reciprocal waivers, at the different phases of the launch and mission. The conclusion points towards the need for at least the same degree of care to be exercised in drafting launch procurement contracts for piggyback payloads as for single payloads: reconciling applicable international and national provisions is essential for legal certainty in such business endeavours.