FINAL REPORT

Forum on Civil Society and Outer Space

Vienna International Centre

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In cooperation with:

ESPI European Space Policy Institute

FFG

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Introduction

The Conference of NGOs in Consultative Relationship with the United Nations (CONGO), with the financial and substantive support of the Austrian Ministry for European and International Affairs, the Austrian Ministry for Transport, Innovation and Technology, the Austrian Research Promotion Agency, ASTRIUM, the City of Vienna, the Wiener Vorlesungen, the United Nations Office for Outer Space Affairs, the United Nations Institute for Disarmament Research, the European Space Policy Institute and the Space Generation Advisory Council, organised a Forum on Civil Society and Outer Space.

The focus of the meeting was on three fields:

1) Use of space: the rules of the road;
2) Relevance and benefits of space applications; and
3) Safeguarding space (see Attachment 1 for programme).

80 participants attended the forum, which was held 8 - 9 October 2007 at the Vienna International Centre (see Attachment 2 for list of participants).

A. Opening Session: Introduction to forum and welcoming addresses

Addressing the Forum on behalf of the **United Nations Office at Vienna, Franz Baumann**, **Deputy-Director-General**, welcomed the participants to Vienna. He stressed the significance of the meeting and the dramatic evolution of the space agenda over the past fifty years. The topics to be discussed at the meeting, in particular the conduct of future space activities and the benefits to be derived from space technology, were relevant to numerous development challenges – most especially those of achieving the United Nations Millennium Development Goals (MDGs).

A number of UN specialised agencies were using satellite images and global navigation systems during human humanitarian emergencies and disaster relief operations. Space technology had become critical to collecting land, ocean and atmospheric data needed to address the challenges that global warming and climate change posed for future generations. Increasing use was being made of satellite communications in such fields as tele-medicine, tele-education and food security.

Gaps persisted in the application of space science and technology in the developing countries. UNOOSA was actively conducting training and capacity-building in such areas as remote sensing, communications, satellite navigation, satellite meteorology, search and rescue, basic space science and space law.

Efforts should continue to bring the benefits of space technology to all on earth and secure the peaceful and substantive use of space. He welcomed the discussion of the benefits that space activities could yield in terms of socio-economic development and the betterment of the human condition.

Friedrich Gehart, **CONGO Vice-President** welcomed the participants to Vienna. The decision to hold the forum stemmed from a firm belief that civil society should be aware of the broad spectrum of activities being undertaken in outer space. Only when civil society had acquired knowledge enough to understand and monitor developments and so form its own judgement, would it be able to derive maximum benefit from the many new space-related technologies. Outer space was a common heritage; its use should be to the benefit of all. That made it all the more important that society at large should be alert to any ecological and security threats that the misuse of outer space might pose.

He hoped that the participants would agree on setting up a permanent NGO committee that would serve as a platform for the exchange of views and information on space matters. With its membership of 500 NGOs, CONGO, the Conference of NGOs in consultative relationship with the United Nations, would be delighted to lend support to such an initiative.

The aim of the forum was to propagate understanding, make new things familiar and familiar things new. The forum would provide a wealth of information and offer the representatives of civil society an opportunity to acquaint themselves with the myriad beneficial applications of space technology and their contribution to human welfare.

In closing, he paid particular thanks to the sponsors and those ho had gone about preparing for the forum. In closing he wished the participants every success in their deliberations.

B. First substantive session: Use of space: the rules of the road. The framework for conducting space activities

1. Introduction

The session was chaired by **Peter Jankowitsch**, **Chairman of the Advisory Board of Aeronautics and Space, Austrian Research Promotion Agency**, who introduced the keynote speaker and the panellists.

In opening the session, the Chair pointed to the very basis of current and future space activities that rested on the solid legal foundation emanating from the Treaty on Principles Governing the Activities of States in the Exploration and Uses of Outer Space of 1967. That treaty had been a timely and highly topical response on the part of the international community to a major political, technological and perhaps even cultural challenge of a new age: the space age.

The Outer Space Treaty (as it was generally known) represented a departure into a completely new field of public international law covering a sphere, the universe, which thitherto had never been subject to any legal rules. Much imagination and vision had been required to complete such a task for which little time was available.

Given the international situation in the late fifties and earlier sixties characterised by a confrontational Cold War, urgent measures were called for to avoid that confrontation spilling out into space and raising the possibility of an arms race on the new frontiers that mankind faced.

The treaty had succeeded in removing from the space environment two of the most dangerous sources of tension and conflict between nations: the possibility of extending national sovereignty into space through the acquisition of territory; and the spectre of nuclear war through a ban on nuclear and other weapons of mass destruction in space.

The treaty not only extended the rule of law into outer space; it also projected new and evolutionary ideas and concepts designed to strengthen international cooperation and solidarity: the most compelling concept being that of space as a kind of global common and its resources as the common heritage of mankind. That concept was most clearly spelt out in

the agreement covering the activities of States on the moon and other celestial bodies concluded in 1979.

It was no exaggeration to say that the treaty had played a primordial and indispensable role in maintaining peace in outer space and keeping it open for exciting new scientific and technological developments that the space age had bought about. The treaty's success derived from the acceptance and respect that its dispositions had enjoyed to date among all space-faring nations and many other beneficiaries of the rule of law in outer space.

The rule of law in space could not be taken for granted. Time and again, even some of the most fundamental rules of the new body of law were being challenged. Mechanisms for its defence should be to hand whenever a threat to its fundamental principles loomed. International civil society should be among those who guarded jealously over the respect of those principles and act as strong defenders of the rule of law in outer space. Furthermore, the latest body of international should not be seen as a static concept, but as a dynamic constantly in need of critical review and adaptation to new circumstances.

A case in point was the emergence of new non-state actors in space brought about by the process of commercialisation and privatisation that posed a host of new problems and legal challenges to outer space. Not only was it important to guard against attempts to weaken or dilute the existing principles of state law; it was also equally essential to develop space law further and make it responsive to new challenges. That the process had come to a halt over the past few years should be a subject of concern to civil society which had done much to heighten international awareness in many others areas of common interest, such as human rights or the protection of he environment.

2. Use of space: the rules of the road

In his keynote speech, **Gérard Brachet, Chairman, United Nations Committee on the Peaceful Uses of Outer Space,** reminded his audience that the utilisation of outer space was in its fiftieth year. The main driving forces in the use of outer space had been: scientific research and exploration; applications of pertinence to the needs of society; security; and defence. More recently, however, the number of state and non-state actors in space had increased. Commercial activities in such areas as telecommunications and remote sensing underscored the need to reassess the rules of the road that had been devised in an attempt to keep space a safe place in which to operate.

Most of the legal frameworks pertaining to space activities had been developed under the aegis of the United Nations Committee on the Peaceful Uses of Outer space (COPUOS). Created in 1959, the Committee had been guided in its formative years by the Chair of the current session, Ambassador Jankowitsch. The list of international treaties and conventions elaborated by COPUOS was most impressive. First and foremost was the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the moon and other celestial bodies (1967), commonly referred to as the Outer Space Treaty. It had been followed by an agreement on the rescue of astronauts, the return of astronauts and the return of objects launched into outer space (1968), a convention on international liability for damage caused by space objects (1982), a convention on the registration of objects launched into outer space (1975) and an agreement governing the activities of states on the moon and other celestial bodies (1979). In the opinion of the speaker, the latter agreement was somewhat weaker than the others. It was also striking that on entering into force in 1984, it had been signed and ratified but by a few states.

COPUOS had also elaborated and submitted for approval by the United Nations General Assembly a series of declarations on principles. Those declarations lacked the legal force of a treaty, yet they constituted an internationally recognised reference point for a number of space-based activities. One of the declarations had served as a precursor to the Outer Space Treaty itself, while others related to such activities as the use of satellites for direct television broadcasts or the use of nuclear power sources in outer space. The speaker drew particular attention to the principles relating to remote sensing of the earth from outer space and the declaration pertaining to the exploration and use of outer space to the benefit, and in the interest, of all states that had placed particular emphasis on the needs of developing countries.

COPUOS had also been instrumental in elaborating a number of resolutions that had reinforced and clarified certain aspects of the international legal framework for space activities. In addition to GA resolution 59/115 on the notion of a launching state, the Committee had drawn up a resolution on the registration of objects that would come before the General Assembly at its current session, while the adoption of space debris mitigation guidelines would be approved at the same session in the context of the annual omnibus resolution.

The speaker dwelt on the significance of the space debris mitigation guidelines. The current use of space was patently unsustainable. Consequently, the Committee’s success in securing

the adoption of a consensus-based set of 'rules of the road' aimed at minimising the production of space debris and reducing the risk of collisions could not be overstated.

Debris posed a particular threat to satellites in geostationary orbit. The fourth guideline referred specifically to avoiding 'intentional destruction and other harmful activities'. The recent experiment by China (the ASAT test in January 2007) had generated 30% more debris, making it necessary for other nations to take evasive action to stop their satellites colliding.

Despite all the advances in space activities, no consensus prevailed in COPUOS on re-opening the Outer Space Treaty or drawing up new conventions. It was generally agreed that a more pragmatic approach should be adopted. Bottom-up, technology-based guidelines and recommendations were seen to offer more apposite and powerful means of developing rules-based behaviour and maintaining a maximum degree of safety in outer space.

A similarly pragmatic approach had prevailed in the work-plan elaborated for the use of nuclear power sources in outer space. Together with the IAEA, a COPUOS working group had drawn up a three-year work plan that would ultimately lead to the adoption of a safety framework by 2010.

As Chairman of COPUOS, the speaker had suggested in plenary that in developing rules of behaviour for secure space operations, the emphasis should be on drawing on the actual operational experience of the principal actors: commercial operators and government agencies alike. A working group would be set up once the parameters, content and schedule had been fine-tuned in informal consultations with key delegations. COPUOS could thus be seen to be moving towards the establishment of rules of the road or a code of conduct for space activities. Those rules, however, would be based on technical and operational considerations - and firm principles. Gone were the days of intricate political balancing acts that had marked the Cold War.

The bottom-up approach remained firmly rooted in the Outer Space Treaty. It maintained the founding principles of the freedom of space exploration and utilisation enshrined in Article 1 of that treaty, as well as that of the non-appropriation of outer space and celestial bodies embedded in Article 2.

COPUOS did not explicitly address the military use of outer space. Its remit covered both the (non-aggressive) military and civilian use of outer space. Nor did COPUOS address the prevention of weapons being deployed in outer space; that issue fell within the bailiwick of the Conference on Disarmament in Geneva. That notwithstanding, all delegations to COPUOS understood the impact that the deployment of weapons could have on the safety of all outer space activities.

COPUOS was not the sole United Nations body addressing the issue of regulating space activities or developing applications of space technology. The International Telecommunications Union, an agency older than the United Nations itself, organised and coordinated frequency allocations as well as orbital slots in geostationary orbit. While not regulating the use of outer space, agencies such as the World Meteorological Organization, UNESCO, the International Oceanographic Commission and UNEP developed 'best practices' in the use of satellite systems and satellite data.

The speaker cited two major examples outside the UN system: the International Charter on Space and Major Disasters instituted by the Centre National d'Etudes Spatiales (CNES) and the European Space agency (ESA) in 1999; and the search and rescue COSPAS-SARSAT system developed by Canada, France, Russia and the United States that had been in operation since 1982.

Manned space activities deserved especial mention. Mostly driven by the technological challenges posed by space over the past fifty years and the proven mastery of certain capabilities (viz. Soviet and US space missions, and more recently that of China), manned space activities were becoming increasingly governed by the urge to 'go beyond the horizon' and explore the solar system.

Humans had always been spurred by the urge to discover and explore. As evidenced by early explorers and circumnavigators of the globe, polar explorers and mountaineers – as well as the race to the moon – exploration was never complete until humans had gone somewhere new and come back to report on what they saw.

In the century to come, space activities would be driven by two diverging goals. The first would be the urge to participate, in cooperation or competition with the United States, in the exploration strategy with a major 'discovery' component. The second would be to focus on space applications that were of direct benefit to society.

Within that context, the rules of the road needed to be firmed up and regulatory frameworks put in place at the national and international levels. The speaker reiterated the need to control space debris and the use of nuclear power sources in space: a code of conduct was called for. It was a mix of strategic considerations, technological challenges and social benefits: a realm in which the United Nations should continue to play a key role and ensure the developing countries access to space applications.

3. The notion of peaceful purposes in outer space law

In her presentation on the notion of peaceful purposes in outer space law, **Ulrike Bohlmann, Legal Affairs Department, European Space Agency,** focused first on the history of the term 'peaceful purposes'. It had been used in the General Assembly resolution 1348 (XIII) of 13 December 1958 and re-appeared a year later in the General Assembly resolution 1472 (XIV) on the establishment of COPUOS, one of whose tasks was 'to review the scope of international cooperation in peaceful uses of outer space…' The notion was also to be found in the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space (General Assembly resolution 1962 (XVIII)) that paved the way for the Outer Space Treaty in 1967.

The latter treaty was the major legal instrument in space law. It had been ratified by 98 states, including all the ESA member states and those states with important space programmes, such as the United States, Russia, Japan, China and India. Several references to peaceful purposes were to be found in the preamble to the treaty, Article III of which referred specifically to '…activities in the exploration and use of outer space (…) in the interest of maintaining international peace and security…'

Article IV of the treaty contained detailed prohibitions on the use of space, most notably the prohibition to place in orbit around the earth any objects carrying nuclear weapons or other weapons of mass destruction. In the same Article, it was stated that the moon and other celestial bodies should be used by all states parties exclusively for peaceful purposes. The speaker pointed out, however, that the prohibition of weapons testing and the conduct of military manoeuvres only applied to the moon and other celestial bodies; it did not apply to outer space in general.

In addition to the use of the term in the UN Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, it was also to be found in the ESA Convention, Article II

of which stated that the purpose of the Agency would be '… to provide for and to promote, for exclusively peaceful purposes, cooperation among European states in space research and technology and their space applications…'

ESA had been founded in 1975; its current membership stood at 17 member states and three (European) cooperating states, while Canada took part in some projects under a cooperation agreement. ESA achieved its prime objective through space activities and programmes, long-term space policy, a specific industrial policy and coordination of European and national space programmes.

In addition to participating in activities related to space science and a mandatory set of programmes, members could also choose to take part in a number of optional programmes: human spaceflight and exploration; microgravity research; earth observation, telecommunications; satellite navigation; and launcher development.

Over the past thirty years, the agency's space science projects had demonstrated the benefits of multinational cooperation. In the field of human space flight, microgravity research and exploration, the agency had undertaken 21 missions to date and the major exploration programme (Aurora) was scheduled for launch in 2011. Under its living planet programme, the ESA earth explorer missions had led to a better understanding of the earth, while its earth watch programme had initiated long-tem monitoring of the planet. As a spin-off, search and rescue systems had been introduced, with countries around the globe joining the initiative. In the field of telecommunications and satellite navigation, ESA had developed advanced technologies for telecommunications applications. It currently ran a European geostationary navigation overlay service and was working on the introduction of its own navigation system (Galileo). It had also developed one launcher jointly with Russians and had a long tradition of cooperating with COPUOS where it enjoyed observer status. ESA had participated in UN programmes aimed at promoting the transfer of know-how as a key input to sustainable development. It supported fellowships and training schemes/workshops and contributed to specific UN space application programmes.

With UNESCO, for example, it sought to bring the benefits of space to developing countries through activities related to: monitoring cultural and natural heritage (UNESCO world heritage sites and biosphere reserves); evaluating the impact of climate change; assessing biodiversity in Central America; and managing water resources in Africa. Those endeavours

were backed up by technical assistance in such fields as capacity-building in the use of space technologies.

Reverting to the notion of peaceful, the speaker stated that it was generally interpreted in good faith to mean 'non-aggressive': prohibiting a threat to or breach of the peace. The Outer Space Treaty, however, did not contain a definition of the term. The common practice was a determining factor, yet common practice did not encompass all states. The practices of the space powers, which relied heavily on the use of outer space for security and defence purposes, carried substantial weight. That notwithstanding, no formal protests against those practices had been lodged by any of the states parties to the outer space treaties.

In the ultimate analysis and akin to practice on the high seas, all non-aggressive (even military) uses of outer space respecting the terms of the UN Charter and respecting the specific prohibitions of Article IV of the Outer Space Treaty were deemed lawful.

4. NGOs, space applications and space law

Frans von der Dunk, Professor, University of Leiden, **the Netherlands**, spoke on the regulatory framework for space applications and interaction among international organisations. He spoke of the topicality of the subject, given the increasing downstream potential of space activities and the role of NGOs. A clear distinction was to be drawn between space activities and space applications. Whereas space activities fell within the purview of UN treaties, such as the Outer Space Treaty and General Assembly resolutions, and customary law, space applications constituted a much broader area that entailed recognising other legislations and involved different legal regimes. For example, satellite communications, including tele-health and tele-education, involved ITU and WTO, while earth observation and the distribution of findings called for the assurance of copyright.

In space law reference was made solely to intergovernmental organisations (IGOs). No reference was made to NGOs as such. The concept of non-governmental entities applied to non-state commercial parties, including non-profit organisations. In conducting space activities, all parties operated under the aegis of a state (and not as an IGO or NGO) and states were internationally liable.

As for applications, ITU did not offer NGOs autonomous standing; the backing of a supporting state was needed in order to 'get a slot'. Neither NGOs nor private companies were

represented in the WTO; the EU was the sole IGO among its members. In the field of international property rights, NGOs were on the same level as private companies. In applications throughout, however, national law applied to a much greater degree than international law and legal positions varied greatly, thus underscoring the need for harmonisation.

In concluding, Frans von der Dunk urged NGOs to acquire observer status in such bodies as UNCOPUOS and ITU. He also encouraged lobbying on an international scale within the context of OED and elsewhere in order to protect NGO-specific interests. In the ultimate analysis, thought might be given to convening a special session of the International Astronautical Congress that thitherto had proven to be an excellent non-governmental forum.

5. Space traffic management

Speaking on behalf of Kai-Uwe Schrogl, Secretary-General, European Space Policy Institute, **Wolfgang Rathgeber, Research Fellow, European Space Policy Institute**, drew attention to the enormity of the problem posed by 'traffic' in outer space. Of the 30,000 catalogued objects in orbit, 12,000 were larger than 10 cm and thus posed a potential threat to the safe operation of 600 satellites in orbit. Following the Chinese ASAT test in January 2007, 2,000 more long-living objects had been added to the space debris that had accumulated in outer space and given rise to three collisions to date.

The situation called for effective space traffic management. Drawing up a set of technical and regulatory provisions, however, posed a challenge as the primary focus to date lay on states as the actors in outer space, with insufficient provisions for the operations of non-governmental, private actors. Law-making within the framework of UNCOPUOS was slow and susceptible to competition from other international organisations (ITU and WTO). Furthermore, space law could be deemed 'soft' as distinct from 'firm' binding international law. A clear need existed for a new conceptual approach, comparable to the law of the sea, based on functionality, new forms of interaction and new implementing organisations.

A study conducted by the International Academy of Astronautics had identified two dimensions of space traffic (scientific and regulatory) and three phases (launch, in-orbit and re-entry). Whereas there had been a slow, but steady decline in the number of launches since 1980, the number of countries with launching capacities and launch facilities had increased. Owing to space debris, the number of catalogued objects was steadily increasing,

although the number of active satellites remained constant at 6-7 per cent of the total. Clearly space surveillance/ space situational awareness systems had to be improved and data sharing developed further. Information on 'space weather' was still limited and bore improvement.

Re-usable space transportation systems were still an open issue. Human spaceflight had accounted for 13 percent of all launches over the past 20 years and would remain at that level. However, if safety could be guaranteed, the number of suborbital human flights might increase, although due account would have to be taken of the future introduction of such technologies as tethers, stratospheric platforms or space elevators.

Given the growth in space activity, the general principles of space law provided a basis and rationale for a space traffic management, but did not suffice for a comprehensive regime. Certain elements were to be found in international space law and international telecommunications law, as well as in the IADC/UNCOPUOS guidelines on debris mitigation. Moreover, in arms control/ disarmament negotiations, pre-launch notification practices had been developed in the Hague Code of Conduct against Ballistic Missile Proliferation, whereas space law related solely to post-launch registration.

Space traffic management, however, was not to be seen as the sum of those approaches, but should take the form of overarching legislation. It was essential that rules be set up for the provision and management of space traffic data, matched by an effective notification system extending over the whole spectrum of space operations from launch to re-entry. In summary, the traffic rules should provide for: launch safety, zoning, rights of way, prioritisation of manoeuvres, human spaceflight security, regulation of geostationary and low-earth orbit traffic, debris mitigation, re-entry safety and environmental considerations.

Meaningful space traffic management scheme was predicated on harmonised national licensing mechanisms, effective enforcement and arbitration mechanisms and operative oversight, be it through a United Nations entity such as the International Civil Aviation Organization (ICAO) or a private entity. It was an open question whether space traffic would ultimately evolve into air traffic in another dimension. Whatever direction it took, space traffic was not merely an extrapolation of air-traffic, but a compatible subsystem.

As evidence by the increased attention being paid to space traffic management in workshops, studies (such as the report by the International Association for the Advancement of Space Safety) and various dedicated meetings, the debate was on. Concrete action would follow.

6. Exploring and exploiting outer space

Louis Friedman, Executive Director, the Planetary Society, opened by citing Marcel Proust: 'The real voyage of discovery consists not in seeing new landscapes but in having new eyes.' The benefits derived from that voyage of discovery were twofold: the acquisition of a greater understanding of the Earth as the planet on which man lived, and recognition of space as a powerful source of inspiration.

In his summary of recent highlights from the solar system, Louis Friedman focused on the exploration of Mars where the two rovers landed in the context of the Spirit and Opportunity missions had revealed traces of water – and hence the possibility of life at some stage in the planet's history. At the same time, the collection of evidence from other planets, such as dust storms on Mars and the inordinate greenhouse gas missions on Venus, had permitted a fuller understanding of the impact of climate change on Earth.

Exploration continued unabated. The Japanese, for example, had a satellite in orbit around the moon and its Hayabusa mission had been designed to secure samples from the near-Earth asteroid Itokawa. Moreover, the very fact that Pluto still remained unvisited and the recent discovery of the dwarf planet Eris provided further incentives to launch out into space.

The wide range of missions to Mercury, Venus, Jupiter, Saturn and Pluto and the current exploration of comets and asteroids was comparable to the circumnavigation of the globe in the Middle Ages. The growing number of missions, however, also bore the risk of duplication, while the fact that a $25 million prize had been set up for the first private mission to reach the Moon would undoubtedly encourage newcomers to the scene.

That notwithstanding, the nine current and planned missions to Mars and five similar ventures to the Moon bore witness to growing global interest in space exploration. However, given that growing interest, the unprecedented number of national missions to the Moon that were being planned and the shift from robots to humans in exploration activities made it all the more pertinent to pursue the issue of global space exploration within the context of an international

lunar decade. The space agencies had already concluded a global exploration strategy; it was thus feasible to consider a similar agreement in space cooperation.

The purpose of that strategy within the context of an international lunar decade would be to provide for: (a) cooperation among spacefaring nations planning lunar missions; (b) framework for support to scientists in developing counties for lunar research and participation in space programmes; and (c) public education and outreach bridging interest in science and exploration, including interest in the humans returning to the Moon.

The challenges that international space cooperation faced were at two levels. At the level of the Moon and Mars, they related to endorsing the concept of an international lunar decade, establishing the global strategy and furthering the shift from robots to humans in national and international space missions. At the other level, it related to protecting the Earth. The focus would be on near-earth objects and setting up a possible planetary defence, as well as on earth observations and changes in the global climate. It also included the exploration of other habitable worlds and moving away from the Earth to extra-solar planets.

At both levels, the endeavours related to space cooperation would provide for a greater understanding of both planet Earth and other planets: a concept firmly encapsulated in a quotation that the speaker drew from T.S. Eliot: ‘We shall not cease from exploration, and the end of our exploring will be to arrive where we started and know the place for the first time.’

7. Discussion

The ensuing discussion opened with an exchange of opinion on the inspirational aspects of space. The pioneering aspects of space activities were not seen to be the sole source of inspiration; another was undoubtedly recognition that the people of the world were but inhabitants of a minor planet whose significance paled in comparison to others, particularly when considered in the light of on-earth conflicts. While ESA, for example, had taken steps to inspire others (albeit not on the same scale as NASA), it was no easy task, particularly since the EU had displayed no interest in the inspirational aspects of space activities, but rather in business considerations related thereto.

Given the exponential increase in the number of active players in space, concern was expressed over pollution and the failure of governments to introduce laws governing pollution. It was explained that one solution lay in increased lobbying. The space debris issue had been

taken up at the space agency level. Governments should be alerted to the fact that failure to act could well jeopardise their own programmes. One country was said to be introducing pollution abatement requirements into the licensing process. Clearly enlightened self-interest could be a useful tack to adopt. That, however, provided little relief from the space debris that had already accumulated as 'waste collection' after the fact was a costly undertaking. Furthermore, space law currently contained no salvage provisions comparable to those contained in the Law of the Sea.

The need to protect an already 'over-populated' space environment was recognised as a matter of utmost urgency. Whether the solution lay in regulation was debatable since it might be viewed as a disincentive rather than an incentive to explore space. A plea was made on a strictly personal plane to reserve the far side of the moon for the purpose of radio-astronomy akin to the treaty governing exploration of the Arctic and Antarctica.

It was generally accepted that in drawing up rules of the road, both private operators and government should be included from the outset. Furthermore, decision-making in such bodies as UNCOPUOS should be based on technological rather than purely political considerations. A question was raised as to the effectiveness of treaties in the absence of legal provisions for verification and punitive measures. It was suggested that enforcement could never be 100 per cent 'watertight'. Political pressure could be brought to bear and certain legal instruments drawn upon, such as the International Court in The Hague. In general, no state in breach of an international law or agreement was prepared to ignore calls for compliance from other states; observance of the Kyoto protocol was a case in point. The issue in the case of space law was not the lack of consensus on international cooperation, but general agreement that the Outer Space Treaty should not be re-opened. Further determining factors were the rapid pace of technology advancement and the volatility of the economic exploitation of space.

In respect of the first issue, it was suggested that it would be inadvisable to put into law or include in a treaty anything that might become obsolete in ten twenty or forty years. In that context, the Outer Space Treaty had been very visionary; it stood as firm as ever and any necessary modifications were better made to the subsequent General Assembly resolutions. At the same time, it was reported that preference was being expressed in some quarters for a 'big bang' solution along the lines of the Law of the Sea.

In respect of the second issue, economic liberalisation and the lifting of market barriers were becoming reality in outer space with commercial operators offering services such as

telecommunications and imagery. That development underscored the need to include non-state actors at the outset.

A definition of the term ‘peaceful use’ of outer space was sought as ‘non-aggressive use’ was felt to be inadequate. It was explained that military uses were deemed ‘peaceful’ as long as they did not pose a threat. In short, anything that was not aggressive was permissible.

Further to being key to achieving specific national aims, international space collaboration sought to engage all players in the furtherance of space and the enhancement of peaceful cooperation. Examples were cited of the way in which something that was technically feasible had been made politically possible, particularly with respect to securing developing country access to space-related benefits. One example was the UNOOSA space application programme that was directed towards building and improving the developing countries’ space capabilities, their use of space systems and access to weather data systems.

A specific question was raised about the percentage of women associated with space activities, their inclusion in decision-making processes and the steps being taken to satisfy the growing interest in space matters among women and girls. It was reported that women constituted 30 per cent of the staff of the French space agency. A Frenchwoman, who had flown twice as an astronaut, had since moved on to become a government minister. Opportunities were seen to exist. In the law faculty at the University of Leiden, close on 6 per cent were women; half of those studying international law were female students. Of the four institutes dealing with space law, one was headed by a woman. In the United States, the intake of female students at MIT had increased dramatically; they currently accounted for half of the student population. In terms of public involvement, however, the picture differed somewhat. The membership of the International Planetary Society, for example, was 80-85 per cent men and 20-15 per cent women.

It was emphasised that civil society interests could be effectively represented and their concerns safeguarded by NGOs being accredited with the relevant international organisations. Most IGOs had provisions in place for NGO accreditation, although eligibility requirements differed from one organisation to another. In the case of COPUOS, for example, achievement of observer status was relatively simple.

C. Second substantive session: Relevance and benefits of space applications

1. Introduction

The session was chaired by **Krishnaswami Kasturirangan, Director, National Institute of Advanced Studies, India**. In opening the session, he remarked upon the timeliness and appropriateness of the forum in view of the space community having recently celebrated the fiftieth anniversary of the launch of the Sputnik. Although not a short time-span, fifty years were not all that long a period when considered in terms of the impact of space endeavours on human society. The 530 communication satellites, 105 remote sensing satellites and 110 scientific satellites in orbit, as well as 13 probes travelling beyond earth's gravity bore testimony to the scope and magnitude of those endeavours, as did the revenue accruing from space activities that currently totalled some US$ 195 billion.

Against that backdrop, it was relevant to enquire about the extent to which the social, economic, scientific, strategic and political benefits of space had percolated down to various segments of society. Cursory analysis showed that six or seven nations enjoyed autonomous access to space. A larger number were capable of building and operating satellites for scientific and application purposes, while still more could use the space capabilities of other nations for their own development needs. That left an appreciable number of nations that had yet to exploit space capabilities to their own benefit; it held particularly true for the developing world. It was thus pertinent to ask about those steps that should be taken to correct the imbalance in the distribution of the benefits of space and ensure fair and equitable access.

In that context, the theme of the session took on particular importance. Space had ushered in a new dimension to development – either through complementarity or supplementarity – or even in the form of stand-alone capability. As would emerge in the discussion of the potential offered by space, space-based remote sensing had been applied to land-use and land-cover mapping, crop inventories, groundwater, hydrology and water resources, as well as forestry and environmental assessments. Just as it contributed to assessing the sustainability of water withdrawal, remote-sensing also helped to identify degradation associated with the use of fertilizers, pesticides and irrigation. It was also used to assess coastal and marine resources, while other applications included urban planning and geology (for oil and mineral prospecting purposes) – not to speak of meteorology.

Space communications ensured connectivity between locations that were otherwise difficult to access, playing a key role in furthering tele-education and tele-medicine, as well as enhancing navigations systems. They were also essential to effective disaster management and mitigation.

Given the potential that space offered for development, the transition from experimentation to operation was of crucial importance. The speaker thus urged the panellists to consider ten issues:

- Extending the current level of outreach of space in different societies, particularly in the developing countries;
- Strengthening the different mechanisms for fully exploiting the benefits of space, including an operationalisation strategy;
- Improving the current scientific basis and technological capabilities, as well as their future orientation;
- Providing space services, including remote sensing data, to countries requiring them, in the light of financial and political considerations;
- Building capacities through such educational instruments as UN-sponsored regional centres for space services, technology and applications;
- Ensuring the adequacy of institutional frameworks that countries needed in order to pursue the use of space, including operationalisation strategies and the role of governmental and non-governmental organisations;
- Determining the effectiveness of current international systems for disaster management, such as those provided under international charters;
- Assessing the role of NGOs and private enterprise; and
- Appraising the cost-benefit ratio of space activities.

Many other issues would doubtless emerge in the course of the debate: in particular the complementarity and supplementarity of space applications, as well as the effectiveness of the delivery of space services. Though not a panacea for all global problems, space was a very useful instrument.

2. Relevance and benefits of space application

In her keynote speech, **Alice Lee, the United Nations Expert on Space Applications**, summarised the history of COPUOS since its establishment in 1959 and the work of its two subcommittees: the Scientific and Technical Subcommittee and the Legal Subcommittee. COPUOS was served by a secretariat, UN Office for Outer Space Affairs (UNOOSA) that was committed to promoting international cooperation in the peaceful uses of outer space. UNOOSA also served as secretariat to the annual inter-agency meetings on outer space activities that were currently considering such items as the space-related outcomes of the World Summit for Sustainable Development and lessons learned from the application of space technologies. UNOOSA also maintained two separate complementary registers on objects launched into outer space since 1957. The number of space objects registered currently amounted to some 12,400 objects. That figure included duplicate registrations as well as functional and non-functional objects. Some 6,000 were still orbiting the earth. Details of the same could be accessed via the web-database maintained by UNOOSA: www.unoosaa.org/oosa/osoindex.html.

In the second section of her presentation, the speaker described the UN Programme on Space Applications (PSA) that addressed issues related to knowledge-based space services, sustainable space technology applications and enabling space technologies, as well as cross-cutting activities. Of the priority thematic areas, the application-based themes were disaster management, natural resources management and environmental monitoring. Those relating to enabling space technologies encompassed remote sensing, communication satellites, global navigation systems, earth observation satellites, meteorological satellites and small satellites. The knowledge-based themes were basic space science and space law, while the cross-cutting themes extended from capacity building and the participation of youth in space activities to issues related to priorities set in the Millennium Declaration and issues pertaining to the World Summit on Sustainable development and the World Summit on Information Society, as well as COPUOS and its action plans.

PSA activities related to capacity-building in the developing countries included workshops, training courses, expert group meetings and symposia, as well as the affiliation of regional centres for space science and technology education and fellowship programmes. Those activities related to increasing awareness of knowledge-based topics, the focus lay on space science and sustainable development as well as the manifold aspects of space law. Other activities were devoted to providing technical advisory services and promoting regional

cooperation, as well as promoting the use of and access to space-based technology and information. The projects had included the distribution and use of global Landsat data for sustainable development in Africa and a series of applications related to satellite communications applications, global navigation satellite systems, satellite-aided search and rescue for distress situations and integrated space technology applications linked to natural resources management and environmental monitoring, disaster management, tele-health/tele-education and basic space sciences.

Details were given of the courses at the affiliated regional centres and the nine interactive points common to the relationship between those centres and the PSA. Projects launched within the framework of the PSA were basically low or zero cost in nature; they involved no transfer of funds between organisations or countries and were based on voluntary and shared efforts. Specific projects were described including: the distribution of Landsat data to Africa; establishment of policy, strategy and budgetary matters related to space applications; implementing space technology to improve human livelihoods; and the establishment of data-sharing policies. Examples were also given of hands-on technical activities in the fields of disaster management, environmental monitoring and tele-health, as well as of the efforts to raise awareness, and increase the use, of space technology applications and secure access to sources of information. In the field of basic space sciences, PSA had supplied donor-funded planetariums ad astronomical telescope facilities, as well as deploying globally an array of low-cost, ground-based instruments for the International Heliophysical Year 2007. In the field of tele-health, it had assessed national needs and established a network for sharing information. The initiatives launched in Latin America and the Caribbean Region were described in *Space Technology for E-health* scheduled for publication in late 2007.

In the third section of her presentation, the speaker described the activities of the International Committee on Global Navigation Satellite Systems (ICG).The outcome of the COPUOS Action Team 10, it was an informal body to promote cooperation in civil satellite-based positioning, navigation, timing and value-added services, as well as the compatibility and interoperability of global navigation satellite systems, while increasing their use to support sustainable development, particularly in developing countries. Of its activities, particular weight was attached to the dissemination of information and the work performed within the context of the ICG portal was described in some detail.

Another activity within the framework of UNOOSA was the UN Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER).Its objective

was to ensure that all countries and all relevant international and regional organisations had access to and developed the capacity to use all types of space-based information to support the full disaster management cycle. A key activity, UN-SPIDER was projected to be: 'a gateway to space-based information for disaster management support; a bridge to link disaster management and the space communities; and a facilitator of capacity-building and institutional strengthening.'

The improvement of public health had been the focus of the COPUOS Acton Team 6. Under a project co-chaired by Canada and the WHO, it sought to use space technologies to provide a demonstration of a monitoring and early warning mechanism for infectious diseases including avian flu and water-borne diseases. The system required space-based data (such as remote-sensing data) and ground-based data (such as health surveillance data) for modelling and analysis. It also took account of policy, strategy and budgetary issues, culminating in the establishment of networks, coordination mechanisms and capacity-building resources.

All the activities described were predicated on five UN treaties pertaining to outer space: viz. the Outer Space Treaty (1967), the Rescue Agreement (1968), the Liability Convention (1975), the Registration Convention (1975) and the Moon Agreement (1979).

3. Satellite imagery and disaster management

In his presentation **Francesco Pisano, United Nations Institute for Training and Research/United Nations Operational Satellite Applications (UNOSAT) Programme** focused on satellite imagery and disaster management. He began by describing how UNOSAT, a UN operational programme created in 2001 by UNITAR and UNOPS, had evolved from a UN-led project including space agencies and the private sector into a United Nations entity dedicated wholly to space applications in support of the United Nations and its field work. UNOSAT was directly supported by ESA, the European Organisation for High Energy Physics (CERN), the site of its computer, and several member states and donors.

The United Nations as a whole was endeavouring to develop a balanced approach to the use of space and satellite applications in the multiple areas in which it held a mandate. For its part, UNOSAT was people-centred and entirely technology-based. It was the only high-technology programme in the UN common system: a provider focused on applications of both

satellite technology and information and communications technology with a view to providing concrete benefits for societies and individuals alike.

That was a key feature of its humanitarian response to natural disasters. Disaster management was based on four basic principles: knowing the hazards (science); understanding vulnerability (technology); assessing the risk (socio-economic); and preparing, mitigating, preventing and responding (community). The solution lay in: (a) preventing and reducing vulnerability and (b) linking relief to development in the shift from crisis to recovery. In most instances, assessment of vulnerability and risk was only undertaken once disaster had struck. In an effective crisis management cycle, however, situation- and risk-analyses should be conducted before crisis signals became apparent. In that context, GNSS and SPIDER could provide access to crucially important geo-information and imagery, thus heightening preparedness and facilitating scenario forecasting.

Geo-information was also an essential input into the analysis of both emergent and imminent risk. Quick easy-to-read data offered the greatest potential benefit before (and after) disaster struck. In the response and co-ordination phases of the disaster cycle, it was essential that geo-information providing an overview of the affected areas, damage to infrastructure, roads and access routes be simultaneously available to both headquarters and field staff.

Post-crisis recovery required analysis of the damage consistent with further development needs (damage mapping), while development planning should avoid rebuilding former vulnerabilities. Throughout such cycles, UNOSAT had been able to provide essential assistance.

The speaker stressed that disasters were always local occurrences; the response thus had to be community-based. Over the past three years UNOSAT had provided direct assistance to 90 communities. It had also worked with UNDP and other agencies on projects more closely related to pre-disaster (monitoring and preparedness) and post-disaster (recovery) operations rather than to immediate relief responses.

A description was given of the applications of earth observation systems in terms of the disaster cycle, including the preliminary damage assessment for one of the Solomon Isles after it had been ravaged by a tsunami. An overview was also given of the added value and synergies to be derived from the nexus of navigation, earth observation and telecommunications systems. UNOSAT was intent upon increasing the impact of satellite-

based support tools through such global projects as the Global Mapping Grant Facility. With its inventory of data and satellite imagery, UNOSAT was setting a new paradigm in space applications and remained committed to translating technology into useful (and usable) solutions.

4. Space applications in support of humanitarian assistance

The presentation on space applications in support of humanitarian assistance was given jointly by **Sandra Sudhoff, Remote Sensing**, **CartONG**, and **Yann Rebois, Camp Mapping, CartONG.** Their organisation was a French NGO based in Chambery that was currently implementing a data management project together with UNHCR. The main objective was to gather and analyse information as a basis for decision-making by those concerned with providing humanitarian assistance to internally displaced persons in Northern Uganda.

The greatest challenge lay in monitoring the movement of people from camps to return locations as needs at the individual sites varied in relation to their size. Settlement patterns differed as movement from camps to villages of return was a gradual process. All the information available at any one stage in the process had to be considered and validated in the course of analysis. That entailed taking GPS coordinates for the camps and other sites and verifying them against satellite images (Landsat) where necessary. In some instances, however, the GPS information provided by some organisations had proved inaccurate when plotting it on a satellite image. Steps had been taken to improve the degree of accuracy that was essential to in-depth analysis of settlement patterns. Furthermore, a Google map application had been used to map all sites and camps, as well as display information and photographs that could be used by participants in the project.

It was necessary to recognise the different settlement patterns and distinguish between return locations, decongestion sites and camps, particularly in otherwise inaccessible areas. That distinction based on a set of specific criteria was critical to determining the type of assistance ultimately required. Shape files of old village boundaries (derived from Ugandan census data) were used to establish whether the location was a village of return or merely a temporary site. Furthermore, site names were subject to change and many places bore different names after years of displacement. Old topographic maps were being used to trace former settlements and establish their original size and names.

The information so gathered was then linked to the return monitoring database to ascertain whether the villages and site names matched each other. Some high-resolution satellite imagery had been obtained and was being used on a pilot basis for the purposes of camp coordination, decommissioning and closure, in addition to camp mapping, research and surveys.

For all the benefits they offered, space technologies such as satellite images were expensive. Moreover, images were difficult to download in the field owing to power cuts. Even when the imagery was free or purchased by other organisations such as FAO, downloading was time-consuming and at times impossible. Transmittal via postal services or even diplomatic pouch was not always a feasible option.

CartONG was making every effort to obtain cheaper/free-ware images for a time-series analysis and detection of change in settlement patterns and extending the scope of the project to include land-use. It had obtained a NV software licence as an NGO. Collaboration with RESPOND, an alliance of European and international organisations working with the humanitarian community to improve access to maps, satellite imagery and geographic information, was projected. CartONG was also planning to extend its work in the region to include a digitised road mapping project in cooperation with UNOSAT and the United Nations Joint Logistics Centre.

5. Remote sensing

In her presentation, **Yvette Stevens, former Director-General, United Nations Office for the Coordination of Humanitarian Affairs**, addressed the issue of remote sensing from the point of view of navigation. She pointed to the benefits that satellite technology offered. Whereas satellite technology had been widely used in telecommunications, the same did not hold true for satellite navigational systems despite the enormous potential that such systems offered in conjunction with remote sensing and geographical information systems (GIS). At the same time, the difficulty of proving an effective humanitarian response using such systems had been exemplified by the problems associated with the earthquake in Pakistan.

A number of global navigation systems were operating or being developed around the world. They included the US NAVSTAR Global Positioning System (GPS), the European Galileo system, the Russian Global Navigation Satellite System (GLONASS), all three of which

offered worldwide coverage using medium earth orbit satellites, as well as the Chinese Beidou system, which offered limited coverage and used satellites in geostationary orbit.
GPS was the only functional global navigation satellite system. Originally conceived as a component in a broader military infrastructure to fulfil navigational tasks, its scientific value became apparent upon commissioning. GPS with a constellation of at least 24 medium earth orbit satellites had become a widely used aid to navigation across the globe and a useful cartographic, commercial and scientific tool. It also provided precise time references for many applications, including the scientific study of earthquakes and synchronisation of telecommunications networks.

Once completed, Galileo would comprise 30 satellites orbiting 24,000 kilometres above the earth. It would provide a civilian alternative to the military GPS network. It also promised location precision of around one metre, as opposed to 10 metres offered by the US version. GLONASS was a radio-based satellite navigation system. Originally developed by the Soviet Union and currently operated for the Russian government by the national space force, it was the Russian counterpart to GPS. GLONASS had both military and civilian applications.The current Beidou-1 system (made up of 4 satellites) with its limited coverage and application was still at the experimental stage. China planned to develop a truly global satellite navigation system comprising 35 satellites which would be known as Compass or Beidou-2.

GPS had many land, sea and air applications. The most common airborne application was navigation by general aviation and commercial aircraft. It was used at sea by amateur sailors, commercial fishermen and the merchant marine. The scientific community used GPS on account of its precision timing capability and positioning information. Surveyors used GPS on account of its accuracy and short set-up time. Recreational uses were as diverse as the sports themselves and GPS had become a common feature in motor cars.

In a green paper issued by the European Commission, a host of GPS applications had been identified: location-based services and emergency calls; road transport; rail transport; maritime, inland waterway and fisheries navigation; air transport; civil protection, emergency management and humanitarian aid; dangerous goods; livestock transport and feedstock management; agriculture, parcel measurement, geodesy and cadastral survey; energy, oil and gas; and search-and-rescue services. Other applications included: logistics, environment, science and the maintenance of public order. Moreover, satellite navigation systems could also benefit the logistics sector and facilitate multimodality.

From the standpoint of NGOs, global navigation satellite systems would facilitate navigation in remote areas and locate callers unable to indicate their precise position. They could also be used to track the movements of vehicles and relief convoys in more remote and often dangerous locations, as well as contribute to the monitoring of crops and land-use, thus safeguarding the agricultural environment. They could also be used to locate and monitor shoals of fish. The speaker cautioned, however, that even if accurate images or maps were available, there was often a 'disconnect' between their provision and the action that needed to be taken. A case in point had been the prediction of floods in one region where the maps had been sent to the ministries where they had stayed. It was essential that those who needed the maps actually had them to hand and could use them.

It was also essential that awareness be raised of the potential that satellite technology could offer in terms of humanitarian and development assistance. Resources should be pooled and the maps purchased by UNHCR should be placed at the disposal of NGOs working in the same regions.

6. Societal benefits of earth observation systems

Giovanni Rum, Group on Earth Observation Secretariat, spoke on the societal benefits of earth observation systems. In his opening remarks, the speaker stressed the need to coordinate observations and share all earth observation data. He also underscored the fact that any single problem required many data sets and, by analogy, any single data set could serve many communities.

Given the large number of different observation systems and objectives, the need to coordinate observations and share all data in a standard interoperable format became apparent. That had been the rationale for establishing the Group on Earth Observations (GEO) in 2005. At present, its membership stood at 71 countries and the European Commission, together with 46 participating organisations both from within the United Nations system and without.

Of the societal areas that stood to benefit from a global, coordinated, comprehensive and sustained earth observation system, the speaker focused on nine: reduction and prevention of disasters; human health and epidemiology; energy management; climate variability and change; water management; weather forecasting; ecosystems; agriculture; and biodiversity.

He described the contribution that a warning system for sand and dust storms could make to alleviating the impact of mineral desert sand on human health, the climate and meteorology, oceanic and terrestrial biochemical cycles and ozone chemistry, as well as on life and property and air and road traffic.

Within the context of a project being undertaken by WHO and other organisations, prevention and response control systems had been developed with the assistance of global observation systems. Inputs ranged from vector observations to climate-related information (such as variability predictions and epidemic surveillance). In Ghana, it had proved possible to anticipate the level of vaccinations needed to tackle an outbreak of meningitis.

Global observation systems also played a key role in landslide inventories as evidenced by the work done in Cavallarizzo di Cerzeto. They had also played an equally significant role in the preparation of fire danger maps that were posted each day via the GEO Portal and GEONEcast. The latter disseminated space-based, air-borne and in-situ data and products to users that addressed all nine societal areas listed earlier.

Details were also given of the data generated in respect of solar energy, ranging from those provide through the SoDa service integrator (www.soda-is.com) to those provided via the SSE data set (http//eosweb.larc.nasa.gov/ssse/) and the Helioclim database (www.soda-is.com). Droughts were regularly monitored using global observation systems, on the basis of which colour-coded maps were generated showing abnormally dry areas and areas suffering moderate, severe extreme and exceptional drought. Space imagery had also ensured 100% coverage in the South African census in 2007.

In all its operations, GEO adhered to strict data-sharing principles. First and foremost, data exchange was full and open, with due heed being paid to the relevant international instruments and national policies and legislation. Data and products were provided with a minimum of delay and at minimal cost, with research and education bodies receiving the data free of charge or merely at the cost of reproduction.

7. Support of space applications to people in operations

In her presentation, **Isabelle Julien, Institutional Relations, ASTRIUM**, spoke of the support that space applications could lend to people in operations. She pointed to the technical and financial difficulties that non-specialist organisations had faced when trying to

access space applications. The situation was changing for the better as technologies matured and new capabilities and applications developed. The growing number of satellites permitted increasingly uninterrupted access to still better performance that was matched by improved on-ground developments, new applications and operational products with higher value-added that combined navigation, cartography and communications.

Access to space imagery had been facilitated by international charters, such as the International Charter on Space and Major Disasters, and certain EU initiatives (RESPOND). Satellite communications had brought about an improvement in services delivered by Global Monitoring for Environment and Security (GMES) by virtue of another EU initiative (TANGO).

The speaker described in some detail a piece of emergency management equipment (ELISEO) that combined elements of geo-information, navigation and communications. Developed for civil security personnel operating in unfamiliar areas, it could be supplied as an integrated kit fully equipped with adequate geo-information reference data or as a light terminal for use in the field comprising a rugged portable PC, GIS software, GPS and independent communications linkage.

The system provided GPS positioning, tracking, text exchange and geo-object exchange as well as data exchange and video conference capabilities for staff in the field and at headquarters/communications centre. Support staff and field teams were but a mouse-click away from each other and all information could be exchanged in real time. Potential applications ranged from the protection of relief convoys, exploratory missions and large-scale casualty management in disaster areas.

ASTRIUM provided both the equipment and related services. It was interested in working with the EU, as well as with no-profit and civil society organisations.

8. Discussion

At the outset of the discussion, attention focused on the fire danger index, the GEO Portal and GEONETcast. They were items on the agenda at the upcoming GEO ministerial meeting at which government commitment would be sought to ensure continuity of the systems in the medium and long term.

Although not major players of the likes of GEO, NGOs and small organisations were also able to contribute to the world-wide mission and enjoy corresponding benefits. In that respect, it was suggested that the International Charter on Space and Major Disasters and its application might be improved.

On a related issue it was pointed out that although data were purportedly open to all users, students often encountered difficulties when endeavouring to access post-disaster data which often enjoyed copyright protection. It was conceded that NGO access to certain data bases such as GEONET was not always easy. It was suggested that software and hardware should be supplied at a discounted price or free of charge. In some cases, internet access had to be paid for or was tied to certain conditions. For its part, GEO was working on the GEONETcast with a view to providing data free of charge. However, in order to access the data base, the purchase of a terminal ($1,500) and training would be required. Moreover, whenever possible, GEO used open-source software. One possible solution lay in CONGO joining GEO and enjoying the services available to members.

Other inputs to the debate pointed to the difficulties of commercial operations offering products free of charge. In respect of satellite communications, it was more a question of the services required and linkage with intergovernmental bodies such as the Unite Nations or the EU. That industry could work well with NGO end-users had been amply demonstrated by RESPOND.

From the standpoint of the United Nations, the Organisation could act as a broker helping to secure free or highly discounted data. In the UNOOSA data-sharing project involving the distribution and use of global Landsat data sets for sustainable development in Africa that had been described earlier, data and imagery had been provided to 114 organisations. Other organisations were invited to participate on the condition that they reported on results as part of their contribution to the project.

The UNOOSA website was being used as a portal with hyper-links to other sources, while the United Nations had been trying to get through to universities and their highly motivated students who represented a low-cost source of data. It was recalled that students at the International Space University had devised a general approach to earth observation targeted at small countries; it lent itself to the monitoring of earthquakes.

In the case of UNOSAT, access could admittedly be a long drawn-out process. If the data required were not of a commercial nature, solutions could be found. Most problems were associated with licensing conditions and financial considerations. In the ultimate analysis, however, those who needed to use data should be enabled to do so.

The importance of the coordinating role played by the United Nations was recognised in cross-border projects: all the more so as countries tended to act independently of each other, even though rivers, floods and infectious diseases did not simply stop at national borders. Space data were seen to provide an effective basis for the negotiation of regional water resource management schemes as in the case of the project related to the Euphrates and Tigris.

Although space applications provided maps and extensive data, subsequent action was felt to be wanting by some. Furthermore, had observations of animal behaviour been combined with highly sophisticated space systems prior to the tsunami in the Indian Ocean, events might have been distinctly different. It was recognised that animals had a highly developed instinctive sense and space technology was being used to track animals and preserve wild life in Zambia. Similarly, plans were afoot to use high-resolution space technology in the cultivation of herbal medicines.

Concern was voiced over the inordinate reliance on space technology, particularly in such areas as banking and health. The question was asked whether those who promoted space science had back-up systems in the event of a conflict in space or lack of energy.

It was argued that people should learn not to become too dependent on space. It was recalled that prior to the days of space imagery and other tools, both air and space travel had drawn on other systems that were still available. Space systems did not use excessive amounts of energy once they were in space. High-energy use occurred solely during the launch phase.

Satellites were playing an ever greater role in broadcasting and terrestrial communications systems. The highest degree of dependence, however, was in respect of GPS which would lessen, however, as new systems such as Galileo entered the field.

It was also commented that the concerns over excessive reliance on space systems were misguided at a time when a large majority of the world’s population did not even have access

to such systems. In the realm of development, the challenge was not an industrial matter, but one of empowering people so that they could take charge of their own development. The prime issue was no longer exhaustion of resources, but one of securing the benefit of space applications for the user community. It was essential that specie technology be demystified and the benefits of is use be brought to the fore.

In summing up the discussion, **Krishnaswami Kasturirangan** pointed out that as things stood, it was not a problem of spending millions on satellites in space or investing in instruments on the ground; it was an issue of reticence in terms of the costs associated with the social objectives.

Political considerations were at play and politicians would have to be convinced of the social benefits that stood to be gained. Unless programmes were presented to the end-user in a language he or she understood, they would fail for want of there being a clear 'connection' to something familiar. Disaster management had proven a good framework for global cooperation; it could be taken as a viable collaboration model. Furthermore, in India a cost-benefit analysis of the national space programme had revealed that space applications did indeed deliver solutions that could compete with those offered by conventional systems.

D. Third substantive session: Safeguarding space

1. Introduction

The session was chaired by **Serge Plattard, former Secretary-General, European Space Policy Institute,** who stressed that outer space was a common heritage: a common good of immeasurable importance to the future of humankind. Space was of great strategic value and essential to the long-term sustainability of the living planet.

Space, however, was under threat from the ever-increasing number of satellites orbiting the earth. More than 8,000 active satellites, 10,000 pieces of debris greater than 10 cm and millions of still smaller pieces posed a threat to working satellites. The attendant problem was one of raising space situational awareness. It involved containing space debris, developing tracking systems tracking and disseminating the information, as well as ensuring the proper registration of all objects in orbit.

A second threat was that of the weaponisation of space. Indeed, the militarisation of space was an undeniable fact Despite their not being weapons in the strictest sense of the term, countless reconnaissance/navigation/early warning satellites transmitted and/or processed information that was subsequently fed into decision-making processes or used to heighten military capabilities.

The situation could well change, were a nation-state to decide that its space assets were under threat and had to be protected. Protection could be passive, taking the form of redundancy, hardening and shielding or spreading. A more active form would be to deny access (the worst case scenario) or monitor closely other countries' space assets. Concerned that their assets were in jeopardy, those countries might set about defending their interests. The net upshot could be a renewal of the Cold War, albeit in a new form and on a new battleground: outer space.

The third threat related to near-earth objects on a collision course with our planet: something that had occurred in the past. Although beyond the remit of the panellists, it posed a political and technical challenge that would have to be met at some time.

2. Safeguarding space

The session began with a keynote address by **Patricia Lewis, Director, United Nations Institute for Disarmament Research.** She explored the connection between space security and human security, particularly the impact of an increase in the insecurity and weaponisation of space on the benefits derived from space activities. She also pointed to a perceptible shift on the part of some nations towards excluding others from space activities and warned of the real and opportunity costs of armed conflict in space.

Human security depended to a large extent on space – and vice-versa. As demonstrated by the classic tension displayed by other primates, collaboration and confrontation were innate traits in human society. Although society advanced more through collaboration, trust – in particular collective trust – was one of the hardest things to achieve. It was essential, however, that trust be built into reducing tensions in space.

Fostering that trust or a community of practices had been a concern of UNIDIR from the very outset. Whereas successes had been achieved in respect of small arms, biological weapons, landmines and cluster bombs, little formal activity had taken place in the case of large

weapons such as nuclear weapons or outer space. Informally, however, moves had been made towards the prevention of an arms race in outer space (PAROUS) that had been eclipsed somewhat by work on the test-ban treaty. In the past two years, however, some progress had been achieved. Under the Six Presidents' Approach, China and Russia had been working on elements of a PAROUS treaty and Russia had put forward proposals related to the replacement of weapons in outer space.

Measure to increase space security had been a major topic of discussion at the Conference on Disarmament which at the current year's session had focused on: the adequacy of the legal regime to provide security; transparency and confidence-building measures; and elements of a treaty on the weaponisation of outer space. In the speaker's opinion, the four effective approaches to safeguarding space were: (i) transparency and confidence building; (ii) a new over-arching treaty: (iii) add-ons to the Outer Space Treaty; and (iv) a multifaceted approach.

Confidence-building measures offered the most room for manoeuvre through the elaboration of codes of conduct and cooperative measures (multi-, bi- or pluri-lateral, binding or voluntary) in such areas as the prevention of dangerous practices and accidents that focused on behaviour rather than specific weapon systems. It had been suggested that the codes of conduct could be discussed away from the Conference on Disarmament at 'unencumbered' venues more conducive to consensus.

Cooperative measures were a level down from confidence building and related more to the exchange of information and data, agreements on the prevention of destabilising activities or tracking debris. They could include joint observation satellites and other cooperative ventures. Chances of achieving success in such areas were real and COPUOS offered an excellent venue.

The concept of a new over-arching treaty had met with appreciable resistance. In some quarters, the idea had been rejected, whether it be a new treaty or a subset of the Outer Space Treaty itself. Moreover, the PAROUS proposal was an old fashioned term which some interpreted as preventing the weaponisation of space and others as increasing space security. Similarly, the recent Russian proposal could be interpreted as relating to either the placement of weapons in space or the prevention of attacks on outer space objects from the ground. It was thus more a question of finding an effective means of engaging the major players.

The Commission on Weapons of Mass Destruction had urged the review of the Outer Space Treaty. The hope had been that the review, which would have considered strengthening the treaty and extending its scope, would be undertaken in 2007 to mark the fortieth anniversary. Since there had been no official meeting to mark that event, the speaker paid tribute to CONGO for having organised the forum. She suggested that the opportunity be seized to plan the fiftieth anniversary in 2017 and initiate an extensive review of the treaty and other agreements over the intervening period.

As for the multifaceted approach, an overarching body, an organisation for common security in outer space, had been proposed. A more immediately realisable approach would be to increase synergies and coherence between the Conference on Disarmament and COPUOS. Regulations dealing with the peaceful uses of outer space should not be completely segregated from those addressing military and weapons-related issues.

Another example of a multifaceted approach was the space-security index: an annual survey conducted by a consortium of NGOs. It reflected the shift in conceptualising the goals of the Outer Space Treaty away from focusing exclusively on weaponisation to addressing broader issues. It viewed the legal, technical, civil and military aspects of the space environment, yet it lacked the notion of human security. As previous speakers had pointed out, space technology was enabling countries and users to ‘leapfrog’ over less effective technologies and develop socio-economically at a faster rate.

In its broadest sense, ‘safeguarding’ offered protection or defence that assured safety or safe passage. Space was being safeguarded for humanity, thus necessitating a distinctly human approach: security and disarmament with humanity at the centre.

The speaker recalled the foundation of the Red Cross in 1862 that had ensued in the wake of the frightful weapons of destruction at the time. Its humanitarian founder had foreseen weapons becoming more and more destructive and murderous. Conflict in space would be far worse. Security and disarmament were truly humanitarian issues; disarmament law was firmly rooted in humanitarian law. It was thus essential to reinvigorate the Conference on Disarmament. Up until recently, the disarmament agenda had been shaped by the humanitarian imperative: a concern for people’s health and the damage wrought on the environment and the moral fabric of society. The same imperative was applicable to space security.

Certain worrying trends prevailed. The Conventional Forces in Europe Treaty and the Intermediate Range Nuclear Forces Treaty were under threat; in 2009 the Strategic Arms Reduction Treaty would come to an end. Society was at a tipping point: something that physicists would call a phased transition. One wrong move and great opportunities would be lost; one good judicious move could tip security into a new paradigm of human security and humanitarian action. New creative approaches were needed, as were synergies between different communities of users and the space-faring nations. Most pressing was the need for a radical reform of multilateral disarmament practices. Agents of change would be needed to fulfil that agenda; the most immediate agents of change were the participants in the forum.

3. Satellite registration and mitigation of space debris

The presentation thereafter was given by **Maureen Williams, Professor, Chair, Space Law Committee – International Law Association**, who focused on satellite registration and mitigation of space debris. She briefly described the history of the International Law Association (ILA) which had been founded in 1853 in Brussels. With its headquarters in London, it had some 50 branches around the world. The ILA Space Law Committee, which she chaired, had worked without interruption since its establishment in 1960. Its recent contributions to the debate on space law included: international instrument on space debris (1994); Convention on Dispute Settlement related to space activities (1998); review of space treaties in view of commercial space activities (2002); and comments and suggestions on registration issues (2006).

At the ILA biennial conference in Toronto in 2006, the ILA Space Law Committee submitted its second report dealing with remote sensing, national space legislation and registration. On the last issue, the speaker emphasised the need to review the registration of objects launched into outer space. The relevant UN convention had been adopted in 1975 with 47 ratifications to date. That notwithstanding, certain alarming trends could be discerned. Of the 129 objects launched into outer space in 1972, all had been duly registered. In 1990 160 out of 165 objects launched, in 2002 76 out of 90 and in 2004 59 out of 72.

In its report on the issue of registration in March 2007, the ILA Space Law Committee had recommended that additional information be furnished to the Secretary-General on each object launched, relating to such aspects as mass, ownership, use of nuclear power sources, presence of astronauts, non-strategic details of military satellites, date of decay of the space

object and date of entry into a national registry. The Secretary-General should also be informed of any change in mission or the fundamental parameters of the orbits.

Moves should also be made to avoid significant delays in the registration process. The ILA Space Law Committee had suggested that parties to the Convention should agree to consider the formula 'as soon as practicable' embodied in Article IV of the 1975 Convention as meaning within 24-72 hours after the launch. That suggestion was not without prejudice to certain realities. Some GEO satellites, for example, might take some time before they reached their final orbit position, particularly if using electric propulsion. The final details would remain uncertain for some time.

By the same token, in those instances where GEO satellites were purchased in orbit, the state that procured the launch did not own the satellite immediately after the launch. Once again the final details might remain uncertain for some time. Indeed, the prevailing practice among major launching states was simply to notify in batches, three or four times a year, to save time!

Stricter requirements were becoming essential for the registration of space objects at both the international and national levels. It had been suggested that registration should include details of measures adopted to protect the environment, as well as the commitment to effect a prompt correction in the registry following any change in the information. It had been generally agreed that the Convention should be revised by means of a UN General Assembly resolution or a separate instrument (rather than embark upon amending the text of the Convention itself) so as to make registration more commensurate with actual practice.

The ILA Space Law Committee had also urged that a reasonable level of uniformity be maintained concerning national registries which should also conform to more specific requirements. In the United Nations, dual notification was the normal practice. The UN registry normally took account of that requirement by making dual reference to notifications (national and international), thereby underscoring the importance of national registries. Registration in general was gradually gaining momentum as a result of the growing involvement of private entities and developing countries in space activities. This applied particularly to the field of remote sensing and the right of a 'sensed' state to the information collected over its territory. The problem had, however, lost some of its intensity since 'sensed' states were gradually becoming 'sensing' states in their own right, although clearer

interpretation in the event of disputes was sought as a growing number of private entities were involved.

Given this link between registration issues and remote sensing activities, the speaker drew attention to instances where space legislation lacked clarity. Article IX of the 1967 Outer Space Treaty was very subjective. Together with Article I of the 1972 Liability Convention, it did not clearly address the current risk posed by the increasing volume of space debris arsing from abandoned satellites and small particles in space. The conditions laid down in the 1975 Registration Convention, for example, were insufficient to determine the link between damage caused by a space object to persons or property – or to the environment and the space object in question. The speaker also pointed out that it was not merely a question of inactive satellites colliding, but also active satellites. The ILA international instrument on the protection of the environment from damage caused by space debris was gradually gaining support and was under permanent review by the ILA Space Law Committee. The European Code of Conduct for Space Debris Mitigation (and support implementation) embodied rules and principles on mitigation compatible with those of the ILA instrument.

Underlying that instrument was a general obligation to cooperate in the prevention and mitigation of space debris. More specific obligations included commitments to: prevent, reduce and control space debris; inform and exchange information; hold consultations; negotiate in good faith; settle disputes in a prompt and amicable manner; and observe rules on responsibility and liability for damage caused by space debris to states, persons or objects as well as to the Earth and outer space environments.

4. Leading the way to effective space governance

Ray Williamson, Executive Director, Secure World Foundation spoke on effective space governance. He opened by introducing the World Secure Foundation: a US privately funded, non-profit foundation devoted to promoting cooperative solutions for space security through effective international policies and laws. He warned of space activities being endangered. Whereas space activities that provided innumerable benefits to humankind were rapidly increasing, the surge in orbital activity, including privately funded space flight, meant that certain key orbits were becoming overcrowded. Remote sensing satellites in polar orbits, for example, came very close to each other when crossing the poles.

A further threat to safe space activities arose with the development and use of space weapons, such as anti-satellite devices. The Chinese anti-satellite test in January 2007 had added some 1,500 pieces of 'trackable debris' (> 10 cm). The growing volume of space debris orbiting the earth constituted a major safety hazard to space activities.

Even the smallest piece of debris could cause significant damage to operational space craft as the impact velocities might well exceed 10 km/sec. As a rule of thumb, 25 g of debris (comparable in size to an aspirin tablet) bore the damage potential of a rifle!

The solution lay in limiting the generation of new debris. While welcoming the COPUOS resolution currently before the UN General Assembly as a major step forward, the speaker stressed the need for additional controls. Given the growing number of private (non-state) operators in space, it was essential to step up research into methods of cleaning up the debris that already existed.

Space traffic management also called for improvement as satellites had to be prevented from coming too close to each other. A more open attitude to space traffic management currently prevailed and the need for an effective code of conduct was recognised. Space traffic management should be established and operated according to internationally agreed policies, rules and regulations. The speaker suggested that ICAO might serve as a good initial point of reference.

Equally essential was the need to adopt an international cooperative approach to space situational awareness so as to ensure that working spacecraft and debris could be precisely tracked and positioned at all times. The United States had highly developed space surveillance capabilities; however, the data retrieved were often classified and thus not available to non-military sources. Steps were being taken by the Europeans, Russians and Chinese to develop space surveillance systems. Those developments might ultimately be conducive to the adoption of a cooperative approach. The Secure World Foundation was party to a conference on space surveillance that enjoyed the limited backing of the US State Department and the Ministry of defence. It would take up the issue before the end of the current year.

The overriding concern in space activities related to space weapons. The speaker warned that the use of anti-satellite or other space weapons could well destroy the ability to use the space environment. International agreements banning space weapons should be drawn up

as a matter of extreme urgency. He strongly supported the concept of the space security index to which the keynote speaker had drawn attention.

5. Threat of weaponisation

Rebecca Johnson, Director, The Acronym Institute for Disarmament Diplomacy, first paid tribute to CONGO for having convened the meeting as it was the only event commemorating the fortieth anniversary of the Outer Space Treaty. She opened her presentation with a statement by General Ashy, Commander-in-Chief of US Space Command who had said 'We are going to fight war in space. We're going to fight from space and we're going to fight into space…'

Weaponisation of space required both intention and a sophisticated level of technological capabilities. The United States dominated in terms of technology: it also appeared to have the intention of weaponising space, although there was no political or military consensus that it would be a Good Thing. Combined with the drive towards ballistic missile defences, the threat of space weaponisation came primarily from the neo-conservative wing of the Republican Party. The Rumsfeld Space Commission, for example, had concluded that space interests were a top national security priority and that the US had to ensure continuing superiority in space capabilities in order 'both to deter and defend against hostile acts in and from space' including 'uses of space hostile to US interests'. The Commission identified seven areas of specific interest: assured access to space and in-orbit operations; space situational awareness; earth surveillance from space; global command, control and communications in space; defence in space; homeland defence; and power projection in, from and through space.

The US proponents of space weaponisation advanced three motivations: control – that controlling space offered unrivalled and commercial advantages on earth: vulnerability – that reliance on space assets presented particular vulnerabilities (a Pearl Harbour in space analogy); and inevitability – that weapons in space followed from land, sea and air developments (the historical 'flag follows trade' analogy of applying sea and air power to safeguard commercial expansion).

During the first six years of the Bush administration, an influential cadre had been pushing for the United States to design and deploy weapons for use in and from space, even though history abounded with examples showing that any security advantage gained by the leader in

innovative technology soon narrowed. Moreover, as demonstrated in Antarctica, co-operative international action had been successful in preventing military competition and deployments from threatening a potentially strategic area of international and scientific importance.

Moreover, the pace and drive towards weaponisation in the United States was less than it appeared five years previous, but the predicted 'hedging of bets' by others in reaction to the Bush administration's push had begun. Although, there might be more time to find diplomatic solutions to prevent weaponisation, a growing number of players might be investing in space weapon technologies and options. The threat still loomed large.

Both China and Russia had been pursuing the diplomatic track to ban all weapons from space. In view of the persistent dismissals by the United States, however, both countries appeared to be pursuing technologies to counter, disable, evade or attack any potential US threat in or from space. As noted in the space security index for 2007, China's ground-to-space destruction of its own satellite (widely regarded as an ASAT test) had demonstrated the country's advanced tracking, targeting and precision guidance capabilities in space, as well as its ability to use those technologies for space negation purposes. Given the dangerous indiscriminate consequences and folly of physical ASAT attacks and if neutralising and negating space power was the aim, it would be far cleverer to jam or disable the telemetry, communication links and ground stations.

Space weapons could be grouped as 'space system negation' (essentially ASAT) or 'space-based strike systems'. The first group included electronic systems (jamming and hacking), physical systems (laser or kinetic energy, explosive interceptors or micro-satellites) and high-altitude nuclear detonation devices. The second group was defined as strike systems operating from an earth orbit with the capability to damage or destroy either terrestrial targets (land, sea or air) or terrestrially launched objects (ballistic missiles).

The United States, Russia and China had all conducted research into many different aspects of space negation and space strike weapons. Furthermore, a growing number of countries were developing an increasing number of advance space-based strike enabling technologies through other civil, commercial and military programmes.

The pursuit of missile defences could increase nuclear threats by creating an escalating offence-defence spiral. The use of space for targeting conventional forces might already provoke asymmetrical threats, while weaponising space would simply exacerbate the threats

from space debris and electro-magnetic impulses and provoke other space-faring nations to deploy weapons for use in, to and from space. Fear of losing one's 'eyes and ears' could give rise to miscalculations that led to rushed panicky 'use them or lose them' reactions, with devastating consequences. The development of and access to the benefits from space-based capabilities risked being seriously, perhaps irrevocably disrupted, if space was turned into a potential or actual battleground.

It was essential that the outer space security regime be strengthened. Potential misuses of space assets could turn outer space into a battlefield; those abuses would threaten global security as well as compromise a range of civilian and security applications on which people's daily lives relied. Priorities needed to be set for the collective cooperative prevention of the weaponisation of space, with timely development of international legal instruments and agreements to ensure that no weapons were tested or deployed for use in, to or from space. This might take the form of an additional protocol to the Outer Space Treaty or a new convention/instrument.

Countries with space assets needed to take their active protection seriously. Useful approaches were passive defence (hardening, shielding and enhanced space awareness capabilities) or coordinated policies and strategies (including rules of the road and a firmer legal regime). A more open, transparent and rational analysis should be undertaken of the actual threats, prospects of and alternatives to missile defences and weaponisation of space. Instead of weaponising space in order to deal with the vulnerabilities of space assets, a more sensible approach (and one consistent with the Charter of the United Nations) would be to combine arms control efforts with the technical hardening and shielding of as many satellites as possible, plus space situation awareness, redundancy and passive means of defence. Progress in nuclear disarmament, strengthening the Non-Proliferation Treaty, negotiating a nuclear weapons convention, further efforts to restrict missile proliferation, building on the Missile Technology Control regime and the Hague Code of Conduct Against Ballistic Missile Proliferation would also contribute to security and reduce the chances of space becoming a battleground.

6. Vision of peaceful space

The final presentation in the session was given by **Alexander Karl**, **Co-Chairman, Space Generation Advisory Council,** speaking on behalf of **William Marshall, Chairman, Space Generation Advisory Council**, on the vision of peaceful space. He opened with a definition

of the term ‘space generation’; it applied to those born after 4 October 1957 who could be said to have been born into a completely different world. The Space Generation Advisory Council (SGAC), which supported the UN Programme on Space Applications, dated back to 1986.

As promulgated in the Vienna Declaration of 1999, the space generation was committed to ensuring the future of humankind. In its quest for an understanding of man’s place in the universe, the space generation had been entrusted by following generations with the sustainable development of the planet for a peaceful future. Regardless of culture, language or creed, its members were committed to ensuring that space exploration would improve the quality of life to the benefit of humankind. The space generation was convinced that the common future of humankind should proceed ethically, with an understanding of the long-term consequences of human actions and with humanity walking forward as one.

The aim of the SGAC was to advance human development through the peaceful uses of outer space. Its vision for the coming fifty years of space flight had focused on three themes: ensuring the survival interests of humanity; using space for the benefit of humankind and its environment; and advancing the frontiers of science and technology.

In the ultimate analysis, the SGAC had always striven for the development of space in a manner that ‘safeguarded’ space for humankind as a whole. Safeguarding space encompassed ‘ensuring the long-term viability of all humanity to use space for peaceful purposes’. Space should thus be kept free of any activities that: ran counter to the principles enshrined in the Outer Space Treaty; restricted the use of space by others; and destroyed in any way the finite resources or usability of the space environment.

Safeguarding space was not a simple task. Space debris posed a major hazard for spacecraft; it was increasing exponentially in volume owing to the growing number of collisions in space. In the long term, it would restrict human use of space in certain orbits. Two other factors impinged negatively on endeavours to safeguard space. First, some nations were planning or testing weapons in space, thus effectively denying others access to or use of space. Secondly, unlike the situation prevailing in the use of land, sea and air, conduct in space was not governed by any basic laws.

SGAC thus urged the introduction of rules of the road for space that would prohibit weaponisation and aggressive acts in space and ensure effective management of space

traffic. It was essential that both aspects be negotiated within the context of COPUOS or a similar body, with due consideration being paid to setting up an international space surveillance centre for verification purposes. The SGAC had also urged that the issue of lunar governance and property rights be taken up in COPUOS to guard against the exploration of the Moon being jeopardised by uncontrolled activities.

In closing the speaker described the structure of the SGAC which exercised three discrete roles. First, it represented youth in matters of space policy as they related to the United Nations, industry, the EU, NASA, ESA, JAXA, CSA and space policy institutions. Secondly, it constituted a network and offered growth opportunities for the young. Thirdly, it 'incubated' projects of interest to the young generation. Details of SGAC projects could be downloaded from the website: www.spacegeneration.org. The SGAC also held annual three-day gatherings at a different venue each year that were usually attended by some 100 young space professionals. In the experience of the speaker, 18-35 year olds were most the active participants.

7. Discussion

In the ensuing discussion, a question was raised about the disconcerting decrease in the registration of objects being launched into outer space. The reason lay in the looseness of the Registration Convention and the lack of uniformity among national space registries. Article 4 of the Convention needed a supplementary protocol pertaining to the liability of states-members for damage caused.

The opinion was expressed that the prohibition of weapons in space would be ineffective in view of the technological advances and the insurmountable problems associated with verification. In response to that claim, it was pointed out that people should take a broader view based on the principles of trust and self-regulation. The problem was rooted in philosophical differences and the misguided assertion by some states that they were occupying the new high ground. It was a misconception to argue that since one violated international and terrestrial laws, one could defy the laws of physics and humanity with similar impunity. People had to recognise that they constituted a planet; they were not a mere collection of nation-states. The fundamental plea was for collaboration. In the United States, for example, any force other than military force was considered unreliable. In the ultimate analysis, however, military force was far from dependable and could not provide the quick technological fix that some people sought.

It could not be gainsaid that verification processes could bear technical and political improvement. Verification norms should be developed that were based on convincing the major players that the benefits to be gained from cooperation in maintaining space as an environment or peaceful cooperation far outstripped those to be gained from weaponisation. 100% verification could never be achieved as verification was the nexus of technology and politics. Moreover, the lessons learnt from Iraq should be extrapolated. Security concerns could be met in better ways than weaponisation.

It was suggested that one reason for the irrational behaviour of some space-faring nations lay possibly in their adopting the behaviour and sexual display of primates in the realm of politics.

The lack of accountability in the registration process was regretted and the possibility of launching advocacy campaigns to name and shame incorrigible offenders was raised. Whereas private entities took recourse to settlement procedures – and often without any obligation to publicise the outcome – the situation with respect to disputes between governments was different. The procedures in the Registration Convention were too weak, yet the solution did not necessarily lie in overregulation.

It was felt that the settlement of legal issues required full access to details. In the case of registration, knowledge of military orbits was limited, even though 95% of the satellites in orbit were military in character. It was explained that geostationary orbits were a limited resource. Low orbits, in particular, were overpopulated. As technology advanced, it would be possible to distinguish between man-made and natural debris. Furthermore, states would be obliged to bring spent satellites back to earth. Alternatively, every state should indicate which satellites it wished to maintain in space and all the others would be removed by those technologically capable of so doing.

It was technically complicated to follow orbits. Often the reasons for satellite failure were unknown. Furthermore, means of cleaning up debris still had a long way to go, while hardening or shielding satellites not only incurred an increase in weight but also greater costs.

As of 1996, 95% of the specifically military assets in space came from the United States. Some of those military assets also served commercial purposes, just as some commercial assets served military purposes: dual-use satellites. Much hinged on defining the term ‘military use’. In the early days of space flight, the technology used to monitor emergencies

would have been regarded as a military application. Verification procedures ('eyes and ears in space') would have likewise had their origins in the military sphere. Since those early days, however, many more states had military assets in space, performing functions that were held to be 'non-aggressive'.

At the end of the discussion, **Serge Plattard** asked all five speakers whether they were optimistic or pessimistic about the future. All four speakers declared themselves resoundingly optimistic.

E. Final session: Findings and recommendations of the forum

1. Introduction

The session, which focused on the findings and recommendations of the forum, was chaired by **Otto Koudelka, Professor, Joanneum Research** who introduced the keynote speaker and the panellists. He also guided the debate on the position paper that was presented to the final session.

2. Saving lives through technology

It opened with a presentation on saving lives though technology via *Emergesat* given by **Nicole Guedj, President, Red Helmet Foundation**. As its name implied, *Emergesat* was an innovative technological tool for the management of humanitarian crises and emergencies. Specially designed to meet the needs of operational teams in the field, it comprised an advanced, autonomous communications system that operated via satellite links and a local communication and data exchange network. The efficient and optimised bundling of technologies in a single unit helped to: (a) provide secure links to teams on the ground and back-up centres; (b) facilitate the exchange of information on emergency situations; (c) coordinate and monitor relief operations; and (d) facilitate the decision-making process. In a container weighing up to 750 kg, the unit could be air-lifted into the crisis area. One unit was currently with the French government and a second unit had been deployed to UNHCR operations in Chad. The idea of creating a red helmet force (as distinct from the blue helmets) had not only been accepted by the Council of Ministers in France, but it had also been proposed to the United Nations by President Chirac in 2004. It was reported to have met with

the approval of UN management and had subsequently been included in the current proposals for UN reform.

3. Expectations of the younger members of the space community

The keynote address on the expectations of the younger members of the space community was given by **Norbert Frischauf, Member of the Board, Space Generation Advisory Council**. One of the founding fathers of the Council, he started by quoting Konstantin Ziolkovski who had pointed out that the Earth was the cradle of mankind, yet one could not remain in the cradle for ever. He then embarked upon a summary of space travel and exploratory missions to date for, as Otto Lilienthal had pointed out, it could not be that the world above our heads was limited to the flight of birds alone. The urge to explore was a very human trait. Given the achievements to date, the speaker harboured no doubt that man would be able to track down terrestrial planets as technology improved.

The benefits of space activities were to be seen in the form of telecom, weather and navigation satellites. With launch and satellite capacities growing, the commercial use of space was increasing exponentially. For example, a third major geostationary navigation system was due to join the two others already in orbit. Earth observation using satellite imagery and high-resolution images was a rapidly growing market worth billions of dollars. It could be used, for example, to measure pollution or check the impact of global warming.

The result of increased space activity was, as many preceding speakers had pointed out, an inordinate amount of debris cluttering up the geo-belt and the disruption it could cause to national grids, banking systems and telecommunications that were increasingly, if not wholly, dependent on satellites. SGAC was keenly aware of the dangers posed by space debris. It had urged that incentives be introduced to encourage the development of technologies that could actively control the amount of space debris in critical orbits caused by public and private satellites alike. An ethical code of conduct was needed that would require state and non-state actors to register their satellites as originally envisaged by the Inter-Agency Space Debris Coordination Committee. Furthermore, it was essential that space debris data be made part of the public domain.

Public awareness, the speaker urged, should be raised of the threat posed by near-earth objects. Efforts should be doubled by 2010 to observe all large near-earth objects, while

technologies should be developed to help avert or mitigate potential disasters originating from such objects.

Space tourism was something that had caught the public's eye and fired imaginations. SGAC saw space tourism not as an end in itself, but as one aspect of the usefulness of space technology. It should thus be encouraged; national space agencies had been urged to support private space enterprise and provide their services wherever feasible.

SGAC supported the advancement of space capabilities in developing counties, urging them to pool resources, promote space-related education and research and create an infrastructure that furthered the development of a space programme. SGAC was insistent that a keen awareness of, and information on, space exploration be promoted in developing countries. On a related front, SGAC had recommended drawing up a global space education programme that would not only raise space awareness but also encourage young people to study science and engineering, disciplines that were key to space exploration. To that end, SGAC had urged UNESCO to take an active role in furthering educational programmes in space research, while the International Space University had been commended for its work.

SGAC was all in favour of establishing a moon base. To achieve that aim within a reasonable time frame (by 2027), a reliable international transportation network would be needed to ensure the regular supply or resources and personnel needed for a lunar settlement. Equally necessary would be efficient and sustainable food, water, air and recycling systems and the development of in-situ resource utilisation systems. Both requirements called for a massive research and development effort. In the ultimate analysis, it would be the future generation and the NGOs on the ground that stood to benefit from space exploration and the activities it inspired.

4. Résumé of the forum

Two participants were asked to give a personal résumé of the outcome of the forum and identify what they felt were the priorities for future activities.

For **Louis Friedman,** the overriding impression throughout the meeting had been the sense of optimism that prevailed about space exploration, the opportunities that space offered and the many challenges that could be met. Space could help planet earth to address age-old problems, such as climate change and natural disasters. Governmental and non-

governmental agencies and organisations could bring resources and space assets to bear on crisis areas, be it *Médicins sans frontières* setting up satellite communications or disaster relief agencies using satellite sensing imagery to assess the extent of the damage wrought. Space, however, could not provide a solution to every earthly problem.

In the space age and information society, the prime need was to increase public awareness of space assets and the contribution they could make. It was essential to secure involvement of those who had thitherto not participated. Greater public support for space initiatives was needed.

In closing he cautioned that space was pervasive in the things people did every day; it was a utility and thus taken for granted. It was, however, a fragile utility that had to be preserved with the utmost care.

Frans von der Dunk spoke of the forum having been both helpful and timely. It had pointed to the terrestrial downstream application of space technology in such areas as disaster mitigation, post-disaster reconstruction and pre-disaster contingency planning, as well as tele-health and tele-education.

Given its disparate membership, CONGO would have to ascertain common interests in areas such as humanitarian operations and the efficiencies that could be gained by combining the same. A case in point was the provision of satellite-generated data free of charge to organisations working in the mitigation of disasters and potential disasters. CONGO would also have to lobby effectively with intergovernmental organisations and bring its concerns and common interests to bear on policy-making processes. It would need to establish itself as a partner in the development of appropriate legal and institutional instruments.

Whereas some international organisations had already granted observer or independent legal status to NGOs, CONGO should set about heightening awareness among **all** NGOs of the benefits of space activities in socio-economic terms and the need to provide legal instruments that would guard against the loss of those benefits. As a first step towards identifying common interests, CONGO should survey its membership.

5. Discussion

In the ensuing discussion attention was drawn to the possible conflict between commercial rivalry and the transfer of benefits derived from space activities. Concern was expressed over the environmental hazards created by space tourism on account of the propellants currently used. It was pointed out that the potential advantages of using hydrogen would be outweighed by the problem of distributing the hydrogen in the space craft and the costs of setting up a completely new infrastructure, while the water vapour created by hydrogen-powered spacecraft would create greenhouse gases.

The importance of teaching young people about preserving space as a common heritage and drawing up a space curriculum was acknowledged. Space flight did not need to be part of the course. By analogy with the Mona Lisa, it was not necessary that everybody go to the Louvre; satellite imagery and other (acoustic) simulations could help recreate the experience of space. Enthusiasm could also be generated though balloon experiments or parabolic gliding.

To the mind of one speaker, the fascination with space tourism defied comprehension: all the more so as only one of the space tourists to date had subsequently done anything tangible for education. Religious organisations, however, with their promulgation of the stewardship of the Earth had long stood at the forefront of space education.

Rather than stigmatise space, its multi-disciplinarity that pervaded our daily lives should be underscored. A change in culture was needed. Children could be inspired by dreams and visions of space; they willingly visited interactive exhibitions on space and invariably wanted to know more. The problem lay more at the undergraduate level, although one example cited students in electrical engineering participating enthusiastically in a course on satellite communications and there being no shortage of participants in a post-graduate course on space at the same institute. All that, however, could not mask the fact that Europe desperately needed engineers. In the host country, for example, a person could freely admit to not knowing anything about the laws of gravity, yet it was socially unacceptable to confess being incapable of distinguishing between an opera composed by Mozart and one by Beethoven!

A note of caution was struck on the proliferation of missiles and weapons in space. Concerns were expressed over the ability to provide effective safeguards despite the provisions of the Outer Space Treaty pertaining to weapons of mass destruction.

Given the major advances that had been made over the past fifty years, intervention by civil society was deemed to be of crucial importance. As evidenced in other areas, civil society had contributed to progress. At present, the benefits of space were not a common good for want of effective cooperation. Although NGOs could mobilise awareness, one participant observed that they had been unable to improve matters in Africa. That notwithstanding, NGOs should assume a principal role, if society's hopes and expectations were to be met.

6. NGO position paper

General agreement was reached on the advisability of setting up an NGO Committee on Outer Space. An initial draft had been circulated on the first day of the forum and consultations had been held on possible changes and additions. After an extensive debate, a series of amendments and additions were agreed upon, all of which were duly incorporated into the final text (see Attachment 3 for the text of the NGO position paper).

7. Closure of the forum

In closing the session, the Chair commended the participants on having got through a very crowded agenda. He trusted that they had gained a better idea of the work being undertaken and the issues addressed. He also congratulated the participants on their position paper; it offered a good basis on which to build further.

He expressed his thanks to the organisers of the forum, in particular CONGO. He also thanked sponsors for their extensive support and wished everybody a safe journey home.

Attachment 1: PROGRAMME

Forum on Civil Society and Outer Space
Vienna International Centre
8 - 9 October 2007

Monday, 8 October 2007

9.30 a.m. – 10.00 a.m.	***Opening Session*** ***Introduction to forum and welcoming addresses***
VIC, Conference Room III	
9.30 a.m. – 9.45 a.m.	**Friedrich Gehart**, Vice-President, Conference of Non-governmental Organizations in Consultative Relationship with the United Nations
9.45 a.m. – 10.00 a.m.	**Franz Baumann**, Deputy Director-General, United Nations Office at Vienna
10.00 a.m. – 1.00 p.m.	***First Session*** ***Use of space: the rules of the road. The framework for conducting space activities***
VIC, Conference Room III	
10.00 a.m. – 10.15 a.m.	**Chair:** **Peter Jankowitsch**, Chairman of the Advisory Board of Aeronautics and Space, Austrian Research Promotion Agency **Introduction of keynote speaker and panellists**
10.15 a.m. – 10.45 a.m.	**Keynote speaker:** **Gérard Brachet**, Chairman, Committee on the Peaceful Uses of Outer Space **Use of space: the rules of the road. The framework for conducting space activities**
10.45 a.m. – 11.00 a.m.	**Panellist 1:** **Ulrike Bohlmann**, Legal Affairs Department, European Space Agency **The notion of peaceful purposes in outer space law**
11.00 a.m. – 11.15 a.m.	**Panellist 2:** **Frans von der Dunk**, Professor, University of Leiden **NGOs, space applications and space law**
11.15 a.m. – 11.30 a.m.	**Panellist 3:** **Wolfgang Rathgeber**, Research Fellow, European Space Policy Institute **Space traffic management**
11.30 a.m. – 11.45 a.m.	**Panellist 4:** **Louis Friedman**, Executive Director, The Planetary Society **Exploring and exploiting celestial bodies - where are we?**

11.45 a.m. – 1.00 p.m.	**Q & A session**
1.00 p.m. – 2.30 p.m.	***Lunch Break***
2.30 p.m. – 5.45 p.m.	***Second Session***
	Relevance and benefits of space applications
VIC, Conference Room III	
2.30 p.m. – 2.45 p.m.	**Chair:** **Krishnaswami Kasturirangan**, Director, National Institute of Advanced Studies **Introduction of keynote speaker and panellists**
2.45 p.m. – 3.15 p.m.	**Keynote speaker:** **Alice Lee**, United Nations Expert on Space Applications, United Nations Office for Outer Space Affairs **Relevance and benefits of space applications**
3.15 p.m. – 3.30 p.m.	**Panellist 1:** **Francesco Pisano**, External Relations and Strategic Development, United Nations Institute for Training and Research/ United Nations Operational Satellite Applications Programme **Satellite imagery and disaster management**
3.30 p.m. – 4.00 p.m.	**Panellists 2+3:** **Sandra Sudhoff**, Remote Sensing, CartONG **Yann Rebois**, Camp Mapping, CartONG **Space application in support of humanitarian assistance**
4.00 p.m. – 4.15 p.m.	**Panellist 4:** **Yvette Stevens**, former Assistant Emergence Relief Coordinator, United Nations Office for the Coordination of Humanitarian Affairs **Remote sensing and navigation**
4.15 p.m. – 4.30 p.m.	**Panellist 5:** **Giovanni Rum**, Senior Program Officer, Group on Earth Observation Secretariat **Societal benefits of earth observation systems**
4.30 p.m. – 4.45 p.m.	**Panellist 6:** **Isabelle Julien**, Institutional Relations, ASTRIUM **Support of space applications to people in operations**
4.45 p.m. – 5.45 p.m.	**Q & A session**
6.00 p.m. – 8.00 p.m. *VIC, Restaurant*	***Reception hosted by the City of Vienna***

Tuesday, 9 October 2007

10.00 a.m. – 1.00 p.m.	***Third Session***
	Safeguarding space
VIC, Conference Room III	
10.00 a.m. – 10.15 a.m.	**Chair:**
	Serge Plattard, former Secretary-General, European Space Policy Institute
	Introduction of keynote speaker and panellists
10.15 a.m. – 10.45 a.m.	**Keynote speaker:**
	Patricia Lewis, Director, United Nations Institute for Disarmament Research
	Safeguarding space
10.45 a.m. – 11.00 a.m.	**Panellist 1:**
	Maureen Williams, Professor, Chair, Space Law Committee – International Law Association
	Satellite registration and mitigation of space debris
11.00 a.m. – 11.15 a.m.	**Panellist 2:**
	Ray Williamson, Executive Director, Secure World Foundation
	Leading the way to effective space governance
11.15 a.m. – 11.30 a.m.	**Panellist 3:**
	Rebecca Johnson, Director, The Acronym Institute for Disarmament Diplomacy
	Threat of weaponisation
11.30 a.m. – 11.45 a.m.	**Panellist 4:**
	Alexander Karl, Co-Chairman, Space Generation Advisory Council
	Vision of peaceful space
11.45 a.m. – 1.00 p.m.	**Q & A session**
1.00 p.m. – 2.30 p.m.	***Lunch Break***
2.30 p.m. – 5.30 p.m.	***Final Session***
	Findings and recommendations of the forum
VIC, Conference Room III	
2.30 p.m. – 2.45 p.m.	**Chair:**
	Otto Koudelka, Professor, Joanneum Research
	Introduction of keynote speaker
2.45 p.m. – 3.00 p.m.	**Panellist 1:**
	Nicole Guedj, President, Red Helmet Foundation
	Emergesat: Saving lives through technology

3.00 p.m. – 3.30 p.m.	**Keynote speaker:** **Norbert Frischauf**, Member of the Board, Space Generation Advisory Council **Expectations of the younger members of the space community**
3.30 p.m. –3.45 p.m.	**Panellist 2:** **Louis Friedman**, Executive Director, The Planetary Society **Personal résumé of the outcome of the forum and priorities for future activities**
3.45 p.m. – 4.00 p.m.	**Panellist 3:** **Frans von der Dunk**, Professor, University of Leiden **Personal résumé of the outcome of the forum and priorities for future activities**
4.00 p.m. – 5.30 p.m.	**Q & A session**

Attachment 2: LIST OF PARTICIPANTS

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Mr. Ciro AREVÁLO
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Attachment 3: NGO POSITION PAPER

Adopted at the Forum on Civil Society and Outer Space

The Forum on Civil Society and Outer Space was held in Vienna 8 - 9 October 2007 under the aegis of the Conference of NGOs in Consultative Relationship with the United Nations (CONGO) with the financial and substantive support of the Austrian Ministry for European and International Affairs, the Austrian Ministry for Transport, Innovation and Technology, the Austrian Research Promotion Agency, Astrium, the City of Vienna, the United Nations Office for Outer Space Affairs, United Nations Institute for Disarmament Research, the European Space Policy Institute and the Space Generation Advisory Council.

The global significance of outer space and space-related technology

The participants in the forum reaffirmed the importance of peaceful space activities for improving the common welfare of humankind and the planet, as well as the potential contributions that civil society, including in particular NGOs, could make to that cause.

They recognized the role of space technology in solving problems of regional and global significance and the need to strengthen capabilities to use space applications for the purposes of economic, social, cultural, scientific and technological development.

To that end, it was recommended that awareness of the benefits of space activities be increased; in particular the key role that those activities played in such areas as sustainable development, resource management and the achievement of internationally agreed development goals, within and as supported by international (space) law.

Awareness-raising efforts should thus encompass civil society in general. More specifically, they should incorporate NGOs whose members voiced the concerns of the people and were often referred to as the ‘conscience of humanity’. It was highlighted that NGOs assumed a key role as constructive participants in major conferences and were indispensable partners in development efforts. Advantage should be taken of their societal potential, networks, knowledge, expertise and skills.

International organizations and governments alike were urged to continue the process of opening up to relevant non-governmental actors, as well as support those actors’ efforts to contribute to the fulfilment of the development potential of space activities.

At the same time, NGOs interested in the benefits of peaceful space activities and the promotion of the peaceful uses of outer space should take steps to increase awareness among their constituencies of the value and importance of space activities and the need to support their peaceful development. Those NGOs should consider taking steps to set up an NGO committee on Outer Space.

The role of such a committee should be to:

- Identify issues of space activities particularly relevant to civil society at large;
- Identify new benefits of space activities to society;
- Promote access to the beneficial outcomes of space activities;
- Propose best practices for the exploitation of space activities, from direct benefits such as access to satellite data to broader societal benefits such as peace education, public outreach, capacity development and retention on space activities;
- Prevent a divide between space-faring nations and non-space-faring nations in benefiting from space applications and activities;
- Provide a holistic viewpoint of the potential benefits and impact of space activities;
- Constitute a network of NGOs and potential beneficiaries of space activities and facilitate the access to expertise in relevant fields of development;
- Serve as a forum for discussing and responding to threats to the peaceful uses of outer space;
- Serve as a channel of communication between UN organizations and NGOs dealing with space activities; and
- Be a voice for NGOs on space issues being addressed in UN organizations.

Modelled on similar NGO Committees established under the aegis of CONGO in New York, Geneva and Vienna, such a committee could provide a forum for the discussion of substantive matters in an NGO setting. Committed to fostering cooperation and dialogue, it could promote the creation of NGO partnerships, seek opportunities to support and assist each other and secure access to decision-making processes. Given the importance attached to increasing awareness of space activities as expounded in the Vienna Declaration on Space and Human Development and in light of the location of the United Nations Committee on the Peaceful Uses of Outer Space, the participants recommended that, considering the value of an NGO committee on outer space, the initiative be launched by the NGOs that had participated in the forum. The Vienna CONGO Office stood ready to offer all possible support to such an initiative.