COLLECTIVE SECURITY IN SPACE

EUROPEAN PERSPECTIVES

John M. Logsdon

James Clay Moltz

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Editors

Space Policy Institute
Elliott School of International Affairs
The George Washington University
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Foreword

As an increasing number of countries use space systems to advance their scientific, technological, social, economic, and national security interests, there is a parallel increase in attention to how best to ensure that those systems can operate free of threats of disruption. To date, that freedom has resulted from mutual self-interest in avoiding accidental or purposeful interference with space operations that are peaceful in character. But many analysts and officials around the world are coming to the recognition that more concrete positive steps and more mutual understandings may be needed to provide adequate space security for all who depend on the ability to access and use the space environment.

There has been long-standing interest on the part of many space-faring countries in developing a treaty-based approach to the prevention of an arms race in outer space. The leading space power, the United States, has opposed such an approach, arguing that there is no prospect of such an arms race. Nevertheless, concerns about the potential weaponization of space have increased in recent years. In the United States particularly, those fears have led to the emergence of a community of analysts and non-governmental actors who point out that there are many alternatives to space weaponization for allowing the United States to achieve its space security objectives. They argue that space security is an issue of interest to many countries and that some sort of collective approach to space security is preferable to a unilateral approach that includes the potential resort to space weapons.

With the financial support of the John D. and Catherine T. MacArthur Foundation, the Space Policy Institute of George Washington University's Elliott School of International Affairs in 2006 initiated a two-year project aimed at stimulating international discussions to identify specific positive steps towards collective space security. There have been a number of suggestions, mainly originating in the United States, of approaches that might be internationally acceptable, including increased space situational awareness, various confidence-building measures, "rules of the road," and a space code of conduct. This project is aimed at extending the examination of such alternatives to the broader *international* community of analysts and government officials. It hopes to stimulate regional discussions of space security questions in both Europe and Asia and to provide a basis for further discussions within the United States on how best to achieve overall U.S. interests in space in cooperation with other space actors.

During 2006, the project focused its attention on European perspectives on space security. It first commissioned papers on space security issues from leading European space experts and officials. Although there has been a fair amount of recent attention to security space topics in

Europe, most of that attention has focused relatively narrowly on the capabilities to meet European security requirements. There has not been careful attention given to issues of global space security and to how Europe should be involved in achieving that broad objective. Stimulating such attention has been a key objective of this project.

The commissioned papers were discussed at a May 15-16, 2006, Paris workshop co-hosted by the Paris-based Foundation for Strategic Research (FRS). This volume contains edited versions of these papers.

The "Collective Security in Space" project is being managed by the Space Policy Institute (SPI) of George Washington University's Elliott School of International Affairs. Serving as project director and a co-editor of this volume is SPI Director John Logsdon. He is being assisted by Dr. William Marshall, who is in residence at SPI as its Science and Security Fellow. Serving as senior project consultant and another co-editor of this volume is Dr. James Clay Moltz of the Center for Nonproliferation Studies of the Monterey Institute of International Studies.

We wish to acknowledge our gratitude to the following: at SPI, Audrey M. Schaffer, who handled effectively the complex arrangements for getting all our speakers and other meeting participants to Paris and during the workshop assisted with a variety of administrative responsibilities, and Emma S. Hinds,

whose efforts in translating the edited papers into a publishable format clearly earned her acknowledgement as a third co-editor; at FRS, Xavier Pasco, who made it possible for his organization to act as our Paris co-organizer, and Marylene Pilon, who handled contacts with the conference venue and the hotel where participants stayed; and Agnes Mellot, who helped throughout the workshop process with administrative and logistical arrangements; and at the MacArthur Foundation, Lukas Haynes, who had the confidence in the value of this project that led to Foundation funding. We thank them all for their invaluable assistance and support.

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January 2007

Gérard Brachet

Born on the 27th of October 1944 in Lyon, France, Gérard Brachet holds an engineering degree from the *Ecole Nationale Supérieure d' Aéronautique* (1967), as well as a Master of Sciences in Aeronautics and Astronautics from the University of Washington (1968).

Brachet began his professional career in 1970 at the *Centre National d' Etudes Spatiales* (the French Space Agency) where he was head of the Orbit Determination and Spacecraft Dynamics Department from 1972 to 1974 in the Brétigny space center. He then moved to CNES headquarters in Paris and took the position of Head of the Scientific Programmes Division from 1975 to 1978 and Head of the Application Programmes Division from 1979 to 1982.

In 1982, Brachet left CNES and took the position of Chairman and Chief Executive Officer of SPOT IMAGE and remained in this function until 1994. In late 1994, Brachet came back to CNES where he took the position of Director for Programmes, Planning and Industrial Policy. From November 1996 to July 1997, Brachet was Chairman of the international "Committee on Earth Observation Satellites" (CEOS), which gathers 20 space agencies and 7 international organizations with the objective to coordinate Earth observation satellite programs.

Brachet became Director General of CNES in July 1997 and held this position until September 2002. From October 2002 to April 2003, Brachet advised the French Minister for Research and New Technologies on the Galileo program. Since May 2003, he has consulted for major aerospace companies and public organizations in Europe.

In June 2004, Gérard Brachet was selected to become the chairman of the United Nations Committee for the Peaceful Uses of Outer Space (UN COPUOS) for the period 2006-2008, a chairmanship that he assumed officially in June 2006.

Bhupendra Jasani is a Visiting Professor in the Department of War Studies, King's College London, where he heads a program on military uses of outer space and arms control verification from space. He joined the Department in 1990.

Between 1958 and 1972, Jasani worked for the British Medical Research Council at the University College Hospital Medical School, London and acquired a Ph.D. in nuclear physics and nuclear medicine. Jasani joined the Stockholm International Peace Research Institute (SIPRI) in Sweden in 1972 before joining the Royal United Services Institute for Defense Studies, London, in 1987 as a Rockwell International Fellow. He completed a project as part of the support programs of the British, German, Canadian and U.S.

governments for the International Atomic Energy Agency (IAEA) on the use of commercial satellite imagery as part of the IAEA's safeguards procedures. This resulted in the IAEA and the United Nations Monitoring, Verification and Inspection Commission (UNMOVIC) using satellite data for their tasks. He has written a preliminary report demonstrating the usefulness of commercial remote sensing satellite data for the verification of the Chemical Weapons Convention under a grant from the U.K. Foreign and Common Office. Under the European Union's Framework 6 Programme, it was proposed to organize a Network of Excellence within Europe that includes the Global Monitoring for Security and Stability (GMOSS) project established in early 2004. Jasani is coordinating two projects, treaty monitoring and early warning using commercial remote sensing satellites, and participating in two other projects on security and population monitoring. For the past few years he has been giving lectures each year at the International Space University, Strasbourg, France, on various space issues. Recently he has been appointed to chair the Technical Commission VIII, Working Group VIII.5 Policies, Treaties and Data Access.

Apart from a number of scientific publications, Jasani has published some 157 papers and books on nuclear and space arms control issues.

Dr. Victor Mizin, formerly a Diplomat in Residence at the Center for Nonproliferation Studies in Monterey, California and now the Leading Research Fellow at the Russian Academy of Sciences' Institute of World Economics and International Relations (IMEMO), has made his career as an arms control, nonproliferation, and global security expert in the Russian Foreign Ministry, where he headed consecutively the Offices of the ABM Treaty and Outer Space, Export Control and Nonproliferation, and UN Peacekeeping Operations and Sanctions (charged with the Iraq-UN file). He participated as an adviser in numerous bilateral and multilateral arms control negotiations and forums, including START I and START II, INF, SCC on the ABM Treaty, the Conference on Disarmament, and the UN Disarmament Commission. He also served as a political counselor at the Russian Mission to the United Nations and was an UNSCOM inspector.

Dr. Mizin graduated magna cum laude from the Moscow State Institute of International Relations in 1978 and received a Ph.D. in political science from the Moscow-based Institute of USA and Canada Studies of the Academy of Sciences of the USSR in 1991.

He has participated in a number of international arms control and nonproliferation conferences and published extensively on security and military issues in Russia and in the West.

Dr. Mizin is the Vice-President of the Center for International Security of the Russian Academy of Sciences' IMEMO Institute, and a member of the board of the Russian NGO Committee of the Scientists for Global Security.

Dr. James Clay Moltz is Deputy Director of the Center for Nonproliferation Studies (CNS) and Professor of International Policy Studies, both at the Monterey Institute of International Studies in California. He has worked for 20 years on U.S. and Russian space, missile defense, and nuclear issues, as well as proliferation problems in Northeast Asia.

Dr. Moltz is co-author of the book *Nuclear Weapons and Nonproliferation* (2002) and co-editor of *Preventing Nuclear Meltdown: Managing Decentralization of Russia's Nuclear Complex* (2004) and *The North Korean Nuclear Program: Security, Strategy and New Perspectives from Russia* (2000). He is currently completing a book manuscript entitled *The Politics of Space Security*. His articles have appeared in such journals as Arms Control Today, Asian Survey, Astropolitics, Bulletin of the Atomic Scientists, Journal of East Asian Studies, and World Politics. From 1993-98 he served as Founding Editor of The Nonproliferation Review.

Dr. Moltz holds a Ph.D. in Political Science from the University of California at Berkeley. He worked previously as a staff member in the U.S. Senate and has served as a consultant to the U.S. Departments of Energy and Defense.

Dr. Xavier Pasco is a Senior Research Fellow at the *Fondation pour la Recherche Stratégique* (FRS), based in Paris, France, where he is in charge of the Department "Technology, Space and Security." Prior to 1997, he was a researcher at CREST (Center for Research and Evaluation of the Relationships between Strategies and Technology), which was associated with *Ecole Polytechnique.*

His research is currently focused on space and high technology policies and decision-making processes associated with national security strategies. He is working more specifically on U.S. policies and their impact on the transatlantic relationship in space activity, both in the civilian and military domains. He has also conducted work on the NATO-European defense structure relationship in the domain of interoperability and coalition warfare. He is also involved in a number of projects studying the use of space for the security of Europe, notably in relation to the "Preparatory Action for Security Research," started in 2004 by the European Commission to structure the 7th Framework Programme (2007-2013).

Xavier Pasco is also Associate Professor at the *University of Marne-la-Vallée* and is a Research Fellow at the Space Policy Institute at the George Washington University (Washington D.C., USA). He also gives lectures in the French Military School in Paris and is the European Editor of the international academic review *Space Policy*.

He has published numerous works (books, articles, papers) on these topics, among which are:

- *La politique spatiale des États-Unis*, 1958-1997, *Technologie, Intérêt national et débat public*, Paris, L'Harmattan, 1997, 300 p.
- *Espace et puissance*, FRS, Ellipse, Paris 1999 (in collaboration).
- As a co-author, *"L' espace nouveau territoire, Atlas des satellites et des politiques spatiales,"* Paris, Belin, 2002, 384 p.
- As a co-author, *The Cambridge Encyclopaedia of Space, Missions, Applications and Exploration*, 2003, 418 p.

Tomáš Valášek works for the Department of Security and Defense Policy, Ministry of Defense, Bratislava, Slovakia. Prior to assuming this position in early 2006, he was Director of the Brussels office of the Center for Defense Information. Mr. Valášek is the editor and co-author of "Growing Pains: The Debate on the Next Round of NATO Enlargement" (CDI, June 2002), and has contributed articles to numerous newspapers and journals, including Jane's Defence Weekly, Jane's Intelligence Review and the Defense News. Before coming to CDI, Mr. Valášek worked as a journalist and as a researcher at the British American Security Information Council.

Tomas Valášek received his Master's degree in International Affairs from the George Washington University and a Bachelor's degree in journalism from the University of Georgia and also studied at the Comenius University in Bratislava, Slovakia; the University of Grenoble, France; and the University of Antwerp, Belgium.

Dr. Detlev Wolter, Head of the Division for European Policy and Law, State Chancellery Brandenburg, was Political Counselor at the German Mission to the United Nations in New York from 2003-2005 and Vice-Chairman of the First Committee of the 60th UN General Assembly, Chairman of the Group of Interested States for Practical Disarmament, and Co-Chairman of the Group of Friends of UN Member States on Conflict Prevention.

In 1986 Dr. Wolter became Assistant Professor of law at the Johannes-Gutenberg University in Mainz, and in 1987 he entered the German Foreign Service. From 1988 to 1999 he served consecutively as Second Secretary, Political Section Embassy in Moscow, Deputy Ambassador to Zambia, and First Secretary, Political Section, Permanent Representation of Germany to the European Union. In 1999 he became Head of Unit, European Department at the German Foreign Ministry.

Dr. Wolter has published extensively on topics in international law and international relations. The

German edition of *Common Security in Outer Space and International Law* was awarded the prestigious Helmuth James von Moltke Prize by the German Society for Military Law and International Humanitarian Law in 2005.

Dr. Wolter studied law, political science and history at universities in Mainz, Germany; Geneva, Switzerland; and New York, United States. He has a Master of International Affairs, Columbia University, New York and a Ph.D. in international law and arms control from Humboldt University, Berlin.

Collective Security in Space: A Key Factor for Sustainable Long-Term Use of Space

Gerard Brachet*

1. Space is Humankind's New Frontier

For the last 50 years, the development of space activities, conducted mostly in a peaceful manner, has contributed greatly to humankind.

For example, the degree to which we rely today on space systems for many daily routine activities is quite incredible. Weather forecasting, radio and TV broadcasting, ship, air and car navigation, mobile telecommunications in the high seas and remote areas, search and rescue, environment data collection, and worldwide time synchronization for data transfer and bank transactions are but a few applications which call upon satellite-based infrastructure located in Earth orbits, at altitudes ranging from a few hundreds of kilometres to the geosynchronous (GEO) orbit at 36,000 km. These applications, benefiting from a strong government-funded research and development effort and the deployment of government space systems, have generated a significant industrial activity in satellite manufacturing, launch services, ground infrastructure, dedicated facilities and user terminals, some of them at a very large scale such as GPS

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* The views expressed here are the personal views of the author and do not necessarily reflect the views of the UN Committee on the Peaceful Uses of Outer Space nor the UN Secretariat.

receivers. During the last few years, the total yearly turnover of the space manufacturing industry (satellite manufacturing and launch services), not including the ground equipment nor downstream hardware and services, reached a level of about $25 billion. A significant portion of this figure corresponds to government funded space systems, with the commercial market representing about 30 per cent. When downstream services and equipment are added, this number grows to more than $100 billion per year. The contribution of space activities to the global economy is therefore significant.

Space based systems have also played, and will continue to play, a major role in support to peace (i.e. peace making, peace keeping and peace building), whether by providing support to armed forces via satellite-based communication, navigation, guidance, intelligence gathering, and environment information, but more importantly, in my view, by providing since the beginning of the space era, an historically unequalled access to information on the plans and activities of states. This new access to information is available, thanks to monitoring and intelligence/reconnaissance satellites, combined with high-speed communication for near real time access to raw data and speedy delivery of information. The contribution of the added capabilities provided by space-based systems to stability and peace during the Cold War was absolutely essential and has put space at the forefront of strategic planners since.

Today, space is our new frontier: from the beginning of the International Geophysical Year (IGY) 50 years ago, space has become an area for scientific research, for discovery, and for exploration. Thanks to systematic exploration, we made some significant achievements. We have a better understanding of the immediate surroundings of planet Earth; we have landed crews briefly on the Moon during the Apollo era; we have launched probes to observe the Sun from a variety of different angles; we have deployed sophisticated robots to study Venus and Mars, both from orbital distance and on their surface with small landers and rovers; we even landed a probe on Titan (a satellite of Saturn) in 2005; we have gotten close looks at Jupiter and its many satellites, at Saturn and its rings, at comets and asteroids, etc. With sophisticated telescopes, we have looked beyond the solar system to other parts of our galaxy and found planets orbiting around other stars, prompting the question: are there other "Earth-like" planets out there? Going beyond our galaxy to other galaxies and nebulae, we study remnants of the radiation produced during the initial stages of our universe. From this variety of scientific and exploration missions, we have learned that our level of ignorance was much worse than expected, that our models were much too simplistic and that there is enormous room for further progress in our understanding of our origins, of the formation of the solar system, of the history of our own planet and, of course, of how life was able to develop at its surface. We also acknowledge that these advances could very well have a profound impact on our present vision of the universe, comparable to Copernicus's and Galileo's contributions in the sixteenth century.

These elements are at the basis of the fascination that space exerts on many people and nations. It explains to a large extent the investments made in space technology and space systems by an increasing number of countries. Today, at least nineteen nations master satellite launch technologies, or are close to mastering them, and have created facilities dedicated to space launch. More than fifty nations or regional organizations operate satellites of various degree of complexity. Many of these new space-faring nations, particularly in the developing world, consider these investments as a vital part of the learning process which will allow them to access advanced technology, motivate their young students in science and technology to stay home rather than emigrate to more industrialised nations, and eventually to gain more autonomy in managing their resources and to reduce their dependence on information provided by third parties.

2. Are Space Activities in Earth Orbit Sustainable in the Long Term?

The increasing number of nations and commercial actors operating satellites in Earth orbit leads to the following question: do we need to plan for stricter rules and regulations at some stage in order to prevent collisions, traffic jams, crashes, and unintended incidents in space such as those that occurred in the high seas and in the skies at various times in history, sometimes leading to conflicts between nations and even wars? If so, who is to be in charge and how is the international community going to address the development of such rules?

Today, there are about 600 operational satellites in Earth orbit and the number is increasing with the recent development of mini- and micro-satellites. This number is relatively small, but much larger is the number of dysfunctional spacecraft, spent rocket upper stages and other large debris orbiting the Earth. Smaller debris, generated mostly by in-orbit accidental explosions and collisions, are becoming a real danger. Let us look at some figures:

About 13,000 objects larger than 10 cm in low Earth orbit and larger than 1m in the GEO orbit are tracked, and a little more than 9,000 of them are properly identified. Only six per cent of these identified objects are operational satellites! Forty per cent are satellites which are no longer functional (i.e. which have reached the end of their useful lifetime or have suffered severe malfunction) or spent upper stages of launchers which put these spacecraft in orbit. The rest, i.e. 54 per cent, consists of fragments (41%) and other objects associated with spacecraft operations (13%). In addition, it is estimated that there are more than 300,000 debris items between 1 cm and 10 cm, too small to be tracked routinely by present space surveillance systems. Below 1 cm, estimates vary but many experts agree that their number is probably in the range of millions! No wonder the Shuttle launch windows from the Kennedy Space Center now include space debris collision avoidance restrictions, and other launch centers are gradually introducing similar safety criteria. These numbers are scary indeed and in absence of any cleaning up system apart from the natural orbital decay for objects in low altitude orbit, debris mitigation measures are needed.

Since the 1980s, the Inter-Agency Debris Committee (IADC) has been the principal focus at the international level for exchange of information on debris issues. It has developed a set of mitigation guidelines which were finalized and officially approved by IADC member agencies in October 2002.[1] These guidelines now form the basis for recommendations being developed by the Scientific and Technical Subcommittee of the UN Committee on the Peaceful Uses of Outer Space (COPUOS). According to the work plan established by COPUOS, these guidelines will be officially submitted to its member states before the next meeting of the S&T Subcommittee in February 2007, and if approved at the COPUOS plenary in June 2007, become part of a resolution submitted to the UN General Assembly in late 2007.

All space actors, government and commercial, are concerned with the risks resulting from this proliferation of space debris after almost 50 years of space exploitation. This explains why they have all agreed to get together and develop these guidelines.

Those actors are even more worried by the potentially much larger damage to the space environment which could result from offensive activities taking place in outer space, if ever it were to become a battleground. Contrary to land, sea and air warfare, where wrecks and damaged craft either sink to the bottom of the sea or can be cleaned up later, damaged spacecraft and other debris stay in orbit for a long time, thus threatening all space operators and endangering other space assets without distinction between friend or foe. Also, international treaties dealing with space activities, particularly the Outer Space Treaty (OST) of 1967, explicitly ban the placement of weapons of mass destruction in space, but do not say anything about other weapons. Everybody agrees that ensuring the safety of satellites is vital to security and prosperity, but the presence of weapons in space, if it ever happens, could actually make it harder to achieve security for these assets.

Fortunately, to our knowledge, no offensive weapons are currently deployed in space and although the debate about the desirability of doing so has been very active in the United States during the last few years, no decision has been made to deploy such weapons as of today. Indeed, it is interesting to note that after almost fifty years of space activities, including thirty years of Cold War between the West and the Soviet bloc, deployment of weapons in outer space has not taken place. Could it be that some wise people have realised that it is not such a good idea after all? Is this in any way a guarantee that it will not take place in the future? Of course not.

3. What Measures are Needed to Ensure the Security of Space Assets? Which is the Preferred Mechanism to Develop a Common Approach to Such Measures?

In a long-term perspective, we need to collectively reflect on possible measures to improve the safety of space operations, measures that we can all agree to and would not adversely affect the economics of space operations. Whether we can easily find the right forum for such discussions is open to debate, as shown by the deadlock in the Conference on Disarmament in Geneva since the mid-nineties. My own view is that the CD PAROS (Prevention of Arms Race in Outer Space) discussions are too narrowly focused on the risk of weaponization of space and are probably hostage to other key disarmament issues. Therefore, in the present context, they will have difficulty making any significant progress. On the other hand, secure access to space and safety of space assets is not only a disarmament issue, it is an issue for all uses and all users of space. Any discussion on ways and means to keep space clean and safe for exploitation would have to involve all parties. Presumably, it would be possible to address this issue in the framework of the UN COPUOS, which gathers 67 nations and reports to the UN General Assembly via the Fourth Committee, but its terms of reference would probably have to be expanded or at the very least re-interpreted. Some participating states might not want to support this evolution, although it is too early to discard this possibility as no such discussion has taken place yet.

Another angle to look at the issue of future space security is to find ways to build confidence by transparency and voluntary exchange and distribution of information, thus reducing the risks of incidents for all operators, be they government military, government civil or commercial. This increased confidence should also reduce the temptation to place weapons in space as a means to protect space assets. Confidence building measures can include notification measures comparable to international agreed rules in the maritime and air navigation worlds, rapid information exchange mechanisms, agreement on space "rules of the road," etc. Some proposals go further, as for example in the proposed Code of Conduct model suggested by Michael Krepon of the Henry L. Stimson Center which would aim at preventing incidents and dangerous military practices in outer space. Key elements in this suggested Code of Conduct include avoiding collisions and dangerous maneuvers, safer traffic management practices, prohibiting simulated attacks and anti-satellite tests, information exchanges, transparency and notification measures and more stringent space debris mitigation measures.[2] Other ideas for increased transparency and confidence building are promoted by various parties, including a new international treaty banning weapons deployment in space, as suggested by the joint China-Russia proposal of 2002 at the Disarmament Conference.

One could be skeptical that a new international treaty with such drastic obligations could be negotiated in the present political environment, but progress can be made towards more transparency and creating a climate of higher confidence between nations when it comes to space activities.

The work which has taken place on the space debris issue within the Scientific and Technical Sub-Committee of COPUOS over the last few years is a good indication that some useful work can take place, provided that political considerations take second place, at least for a while, to a rigorous, technically based approach. COPUOS can also contribute to confidence building via its current work on the application of the Registration Convention of 1975. The implementation of the Registration Convention is not done in a systematic and standardised fashion across states, even those who have ratified the Convention. This led the COPUOS Legal Sub-Committee to establish in 2004 a working group on registration, whose work plan should lead to a set of recommendations in 2007. These would tend to harmonize states' practices and hopefully improve the quality and timeliness of information exchange on satellites and other craft which are launched.

Based on the space debris discussions, one route which could be considered is the setting up of a Working Group under the UN COPUOS S&T Sub-Committee, similar to the Space Debris Working Group, with the purpose to assess the technical soundness and feasibility of "rules of the road for space traffic." This could take as a first discussion basis the International Academy of Astronautics (IAA) Cosmic Study on

"Space Traffic Management," recently released.[3] The legal aspects of such potential "rules of the road" could be investigated by the legal Sub-Committee in a second stage.

An ideal situation would be to have such a Working Group established under a dual umbrella: both the COPUOS and the CD PAROS agenda items could jointly mandate the Working Group, thus establishing a communication link between the COPUOS and the CD-PAROS which has never been in place. It could provide the basis for a joint reflection on how to develop rules for space activities to ensure the safety of future space operations. One should not underestimate the difficulties in achieving such cooperation between two organisations that have different backgrounds, different agenda, and different participants from member states, but such a proposal would possibly produce some interesting, and hopefully useful, reactions.

In conclusion, I believe is essential for all of us to recognize that ensuring long term secured access to, and uses of, space is not a defence issue, it is an issue for both the civilian and military communities. These communities need to work together and find a common ground to establish jointly new "rules of the road" which would ensure a safer future for their space assets simply because they share the same space environment whose degradation would affect all in the same manner.

APPENDIX: The UN COPUOS

The Committee on Peaceful Uses of Outer Space (COPUOS), established by the UN General Assembly in 1959, gathers 67 member states and addresses the applications of outer space such as scientific research, exploration, monitoring of the health of our planet, communications, navigation, etc. Its terms of reference include promotion of international cooperation and developing an adequate legal framework for use of outer space, a mandate which has been fulfilled by the development of the Treaty of Outer Space of 1967, the main pillar of international law when it comes to outer space activities, completed by four other treaties in the following years. All of the treaties were produced by COPUOS and transmitted for approval to the UN General Assembly before their signature and ratification - for the first four treaties - by most major space faring nations. Their precise title and year of entry into force are recalled here below:

- 1967: Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (The "Outer Space Treaty," which entered into force the same year)
- 1968: Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects launched into Outer Space (entered into force the same year)
- 1972: Convention on International Liability for Damage Caused by Space Objects (entered into

force the same year)

- 1975: Convention on Registration of Objects Launched into Outer Space (entered into force in 1976)
- 1979: Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (entered into force in 1984 but signed and ratified by only eleven countries)

In addition to these international treaties, COPUOS addressed other issues over the years which led to the development of "Declarations" or "Resolutions" which were submitted for approval by the UN General Assembly, seeking whenever possible a unanimous approval. These texts do not carry the same legal weight as international treaties but do carry political weight as they seek to encourage a practice resulting from an in-depth concertation within member states of COPUOS. They are listed below:

- Declaration on Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space (1963)
- Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting (1982)
- Principles Relating to Remote Sensing of the Earth from Outer Space (1986)
- Principles Relevant to the Use of Nuclear Power Sources in Outer Space (1992)
- Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit

and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries (1996)

An interesting feature to be noted about these texts is that they attempt to address whenever possible both civilian and non-civilian activities in outer space, even though they sometimes had to restrict themselves to non-military activities. This was the case for example of the 1986 Principles Relating to Remote Sensing of the Earth (UNGA Resolution 41/65), which for obvious reasons did not attempt to address military reconnaissance satellites. It is remarkable that the COPUOS was able to produce a text which satisfied both space faring nations and developing nations even though it addressed the rather sensitive issue of collecting from outer space information on other nations' territories and environment. Of course, image resolution achieved by remote sensing satellites were more modest in the eighties than they are today, but it is striking that the set of principles set in this resolution have survived quite well the testing of time and of rapidly evolving technologies.

COPUOS does not address the military uses of outer space, nor the prevention of weapons deployment in space, but these issues are understood by member states delegations to COPUOS as they may impact the future security of all activities in outer space. Some COPUOS delegations repeatedly stress the need to achieve an international treaty banning the deployment of weapons in outer space.

COPUOS gathers 67 member states and more than 30 “observer” organisations (United Nations agencies, international government organizations - such as ESA - and non governmental organisations) who are all dedicated to improving the international framework for peaceful use of outer space, either by elaborating new legal conventions or principles or by facilitating international cooperation and capacity building in the development and exploitation of space systems.

It is therefore an ideal forum for information exchange on the potential threats to secure use of outer space, not only on threats resulting from the space debris problem, but any other threat which might impact the freedom of access to space and exploitation of space infrastructure.

Notes

[1] Inter-Agency Debris Committee, “Space Debris Mitigation Guidelines,” IADC-02-01, October 15, 2002. The guidelines can be found at: http://www.iadc-online.org/index.cgi?item=docs_pub.
[2] Michael Krepon with Michael D. Heller, “Model Code of Conduct for the Prevention of Incidents and Dangerous Military Practices in Outer Space,” The Henry L. Stimson Center, May 2004.
The publication can be found at: http://www.stimson.org/pub.cfm?id=106
[3] The study can be found at: http://www.iaaweb.org/iaa/Studies/spacetraffic.pdf.

Common Security in Outer Space and International Law: A European Perspective

Detlev Wolter*

Europe and Common Security

Europe has enjoyed an unprecedented level of rapprochement, cooperation and common security since the end of World War Two. This is due to the lesson learned that overall security requires the willingness to put the common objective of mutual, cooperative security above the particular security interests of States. From this common understanding, the avenue was wide open for European integration and the gradual convergence of trade, economic, and social as well as increasingly of foreign and defence policies. A common European Foreign and Defence Policy is taking shape. It is today unthinkable that Member States of the European Union would ever raise their arms against each other. Europe has been able to project its successful model of common security to a broader context as well. In the Organization for Security and Cooperation in Europe (OSCE), the weaving of a close web of political, economic, rule of law and human rights cooperation in the three baskets helped to overcome the East-West ideological and security divide. On this stable ground and in the interest of pursuing common

* The author expresses his personal views.

security in the OSCE, the challenges of ensuring peaceful independence of the Baltic States and of including former Eastern bloc States into NATO and the European Union were successfully tackled. The European Union is now increasingly active as a global player in support of effective multilateralism, respect for international law, conflict prevention and civilian conflict management.

European perspectives on space security are thus deeply engrained in the successful experience of common security. European space activities are devoted exclusively to peaceful purposes. The Statute of the European Space Agency (Article II) stipulates:

> *… [The] purpose of the Agency shall be to provide for and promote, for exclusively peaceful purposes, cooperation among European States in space research and technology and their space applications, with a view to their being used for scientific purposes and for operational space applications systems….*

European military uses of outer space are thus strictly limited to purely passive military uses of a non-destructive nature, such as those of surveillance, reconnaissance, and communication satellites. No European nation is engaged in active military space uses of a destructive nature. All European states support the annual Resolution of the United Nations General Assembly on the

Prevention of an Arms Race in Outer Space. Given its growing economic, political and security interests in preserving outer space as an exclusively peaceful domain, Europe should undertake more vigorous efforts to develop its own independent space surveillance capabilities which could then be shared in a global surveillance mechanism under the auspices of the United Nations.

Europe is now called upon to define its interest in the strictly peaceful use of outer space and the prevention of the weaponization of outer space on the basis of its increasing economic, commercial and security interests in space. When it comes to establishing the future space security system, the European Union should offer its success story of pursuing common security in the interest of the international community. The European model of space security should focus on enhancing those cooperative elements for a space order that make it attractive for every space-faring nation. These elements should be elaborated, drafted and implemented in close cooperation with the other leading space nations. The main tenets of such a space security order should encompass in particular a comprehensive immunity system for civilian and military satellites of a non-destructive capacity, a code of conduct, "rules of the road," and traffic rules as well as regulations to avoid and manage space debris. Such a comprehensive common space security order would protect the security, economic and commercial space interests of the entire space community, and in addition ensure the peaceful use of the global commons in the interest and for the benefit of all mankind.

The Basis for a Space Security Order

The legal, political and conceptual basis of such a system of common security for outer space draws on the 1967 Outer Space Treaty as the "*magna carta*" of space law, the 1982 "Common Security" report of the *Palme* Commission, and the state practice and various draft treaty proposals on space security submitted in the Conference on Disarmament in Geneva.[1]

Outer space as a common territory beyond national jurisdiction is a "global commons" *par excellence*. Security must therefore be common, cooperative security, based on the rule of law and respect for international space law in the interest of all states and mankind as a whole.

The legal status of outer space as determined in the Outer Space Treaty (OST) of 1967 requires that the use and exploration of space have to be in the "interest of all states" and "for the benefit of all mankind" (Article I OST). And thus emerges an implication, indeed an obligation, of all states to embrace "common" or "cooperative security" as the only option for truly guaranteeing the peaceful use of space. Such a cooperative regime finds its legal basis established in the mankind clause in Article I of the OST and the principle of cooperation and due account of the interests of all states in Articles IX and X of the OST, which are the principal elements attributing the status of outer space as a "common heritage of mankind."

However, in view of the risks of transgressing the line between the current passive military uses of space and the envisaged active military uses of a destructive nature in outer space ("weaponization of space"), the substantive and procedural institutionalisation of the mankind clause, the cooperation principle and the peaceful purpose clause as expressed in Articles I and IX of the OST becomes increasingly pressing.

These clauses were introduced in outer space law at the onset of the space age in 1957 by a joint draft UN General Assembly Resolution of the United States, France and Great Britain. These states had the same prime objective as the international community as a whole - to ensure that outer space would not be monopolized by the security interests of one or a group of states but rather be used for the benefit of all states and for mankind as a whole. The peaceful purpose standard as well as the mankind-clause were then codified in the 1967 Outer Space Treaty. However, a controversy still continuing until today arose over the interpretation of the peaceful-purpose clause. The unproductive dichotomy when interpreting the peaceful purpose clause either through the "maximalist" school, according to which any military use of outer space is prohibited, or the "minimalist" approach, viewing the term "peaceful" as only a confirmation of the prohibition of the use of force in outer space, needs to be overcome. The solution lies in interpreting the term "peaceful purpose" in light of both the mankind clause of the common heritage of mankind principle and the cooperation principle as applied to the security field, as well as by developing legal standards of peaceful use of outer space in the interests of the international community as a whole.

State practice, including the annual resolutions since 1981 by the UN General Assembly on preventing an arms race in outer space, bears evidence that the international community has so far only accepted passive military uses of outer space by reconnaissance, navigation and communication satellites but rejects the unilateral transgression towards active military uses with destructive effects in the common space. Steps to deploy a multi-layered missile defence with space-based interceptors would violate the peaceful purpose standard and the mankind clause if pursued unilaterally and without the consent of the international community. The objective of Missile Defence which, according to the U.S. *National Missile Defense Act of 1997*, is to protect against unauthorized nuclear attacks and against limited nuclear attacks of so-called “rogue states,” can be achieved without deployment of space-based weapons systems. Indeed, if pursued in the framework of a cooperative security regime for outer space, an arms race in space that would further stimulate nuclear proliferation on Earth can be prevented.

In its advisory opinion of 1996 on the *Legality of Nuclear Weapons,* the International Court of Justice concluded that the obligation of the nuclear weapons powers to achieve complete nuclear disarmament according to Article VI of the Nuclear Non-Proliferation Treaty (NPT) is an obligation to conclude, and not only to negotiate, a nuclear disarmament and non-proliferation agreement. The UN General Assembly has expressly stated that the obligations of the NPT apply to outer space as well. The unilateral pursuit of a space-based missile defence, with the risk of the weaponization of space, would run counter to the disarmament obligations of the nuclear powers. The bilateral Anti-Ballistic Missile (ABM) Treaty that prohibits the development and deployment of space-based ABM systems implemented the multilateral peaceful purpose standard which has effect *erga omnes.* Therefore, after its renunciation, the ABM Treaty has to be replaced by new cooperative security arrangements safeguarding the security interests of the international community in the use of outer space for the benefit of all mankind.

Seeking Common Security

In the face of the changing character of security threats, "common security" is the new strategic imperative of the post-Cold War era. Even though general international law contains on several accounts the foundation for “common security,” it cannot yet be regarded as a mandatory legal principle. However, the enhanced “common interest” obligations of the Outer Space Treaty render the pursuit of cooperative/common security in outer space a legal obligation in the implementation of the peaceful purpose standard in the use of the common space in the interest of all states and mankind as a whole. The Joint U.S.-Russian Declaration adopted at the American-Russian summit on May 23-24, 2002, according to which both sides agreed to a far-reaching cooperation to meet *common security* challenges, in particular with regard to questions related to the national missile defence issue, opens the prospect that the former rivalling powers are willing to embark on a cooperative *strategic transition* towards *common security*. Without such a cooperative approach and without an adequate multilateral framework safeguarding the security interests of the international community with regard to the use of outer space, the legal principle of the peaceful use of outer space risks losing its practical relevance as a limitation of military uses of extraterrestrial space and would become obsolete in view of developments *de facto*.

The negotiation of a multilateral “Treaty on Common Security in Outer Space” (CSO Treaty) would be an appropriate way to implement the peaceful purpose standard and the mankind clause as manifested in the Outer Space Treaty. In addition, such a treaty would lay the groundwork for a cooperative strategic transition towards rendering nuclear deterrence obsolete, thus replacing "Mutual Assured Destruction" by "Mutual Assured Security." Further adoption of "strategic reassurance measures," as stipulated in such a treaty, would keep outer space free of weapons and allow for an active non-proliferation policy of the international community.

The main elements of such a CSO Treaty can be categorized as follows:

1. Principles of cooperative security in outer space:
   - Transparency and confidence-building;
   - Defensive force configuration;
   - Non-proliferation and disarmament;
   - Protection against unauthorized and accidental missile attacks and attacks in violation of non-proliferation regimes;
2. Prohibition of active military uses of a destructive effect in outer space;
3. Destruction of existing ASAT systems;
4. Confidence-building measures;
5. Protective immunity regime for civil space objects and passive military uses of a non-destructive nature in outer space;
6. Implementation: monitoring and verification by an International Satellite Monitoring Agency; and
7. Codification of further legal standards of

peaceful use of outer space.

The international community should not fall behind the peaceful purpose standards in the use of outer space that were respected by both major space powers even at the height of the Cold War era. The Outer Space Treaty, with its mankind clause and the peaceful purpose standard, has in a far-sighted manner laid the foundation for the establishment of a regime of common security in outer space in order to prevent the transgression towards active military uses of a destructive nature in outer space and to secure a peaceful future in the common space.

Building on its 50 years of successful experience in common security, Europe should take an initiative to present a proposal for a cooperative space security order that will be the basis for a "*pax cosmica*" in the interest of mankind as a whole. The 50th anniversary in 2007 of mankind's first endeavour in space, and the fortieth anniversary of the far-sighted Outer Space Treaty governing man's activity in space, would be an appropriate moment to launch such an initiative.

Notes

[1] For more detail see Detlev Wolter, "Common Security in Outer Space and International Law," (Geneva: United Nations, UNIDIR/2005/29, 2006); *id.*, "Grundlagen 'Gemeinsamer Sicherheit' im Weltraum nach universellem Völkerrecht," (Berlin: Duncker & Humblot, 2003).

New Approaches to Achieving Space Security

Bhupendra Jasani

1. Introduction

During the past four years or so, as far as Earth-bound human activities are concerned, national and international security perceptions have changed. The notion of threats from states has extended to those from non-state organisations. For example, recently two reports have emerged that deal with the concept of security. One, the 2004 United Nations report,[1] identified the following threats:

1. Poverty;
2. Infectious disease;
3. Environmental degradation;
4. Conflict between and within states;
5. Proliferation of weapons of mass destruction (WMD);
6. Terrorism; and
7. Trans-national organised crime.

A state is secured when it is free from these threats. In the second, the 2003 European Union (EU) report, known as the Solana Report,[2] the following threats were identified:

1. Terrorism;
2. Proliferation of WMD;
3. Regional conflicts;

4. State failure; and
5. Organised crime.

While the UN has taken a broader view of security by including poverty, infectious disease, and environmental degradation, there is, by and large an agreement on the threat perceptions between the international community and the EU. Activities in outer space have a number of areas in common. For example, there are concerns about the spread of WMD, environmental degradation, terrorism, and regional conflicts. These in turn affect security in outer space. For example, significant information could be gained by both military and commercial observation satellites about WMD related activities of a state and on continuing conflicts within a state as well as between states. This information could make such satellites very sensitive and therefore prone to attack. Not only this but also the question of frequency allocation and the limited space in communications relevant orbits, may give rise to tensions in inter-state relations. Of course these and the broader use of outer space for military purposes have given rise to the question of the security of Earth orbiting artificial satellites in general. This situation has been further aggravated recently by the shift from the militarisation of space to the weaponisation of space.

The latter consideration has been the result of a perception that during any terrestrial conflict a state may feel the need to deny the adversary the use of his space assets. Moreover, active protection of one's own space assets has become necessary leading to the development, testing, and to some extent the deployment of anti-satellite (ASAT) weapons. Of course, the testing of some ASATs have caused debris in space already in addition to those generated from natural and other human activities in space. This issue is raising considerable concern from the point of view of space security. Now that the 1972 Anti-Ballistic Missile Treaty (ABM Treaty) is no longer in force, concerns are raised because this may give impetus to the development, testing and deployment of both ground- and space-based ballistic missile defence systems. Such a development may have an adverse effect on space security.

The extensive use of outer space for civil and commercial applications has added a new dimension to the debate on space security. The improved capabilities in this area that are approaching those of the military ones are complicating the space security issues. Thus, it can be seen that the question of space security is a complex one. In this paper some of these issues are considered briefly.

2. Uses of outer space

Defensive applications of artificial Earth orbiting satellites were recognised and developed at the outset, and civil/commercial uses soon followed. The latter include:

- communications and broadcasting;
- global positioning (e.g. civil part of the US GPS and the European Galileo);
- imaging activities, e.g. remote sensing for agriculture, resource management, town planning and mining;
- environment monitoring; and
- disaster management.

These constitute some 15 per cent of all space activities. We have now reached a critical stage when the above activities need to flourish against the sustained military competition for resources. Since 1957, the number and quality of military space assets of a number of countries have improved considerably. By 1967, outer space became a heavily militarised environment. This was not surprising as the use of artificial Earth orbiting satellites for defence was conceptualised as early as the late 1940s. The first use of satellites for defence was demonstrated in 1960 with the launch of the first successful U.S. military reconnaissance satellite. Extensive application of space for civil and defence purposes flourished during the Cold War period and continued even after its end.

The efficient use of terrestrial weapons requires accurate knowledge of the nature of targets and their locations provided by photographic reconnaissance satellites and geodetic satellites respectively. The former are also used in planning bombing missions. With this knowledge, a missile or an aircraft carrying a warhead can be guided accurately to the target by navigation satellites. Such information as well as command and control data is communicated by communications satellites. The trajectory of a missile, affected by such atmospheric conditions as the temperature, particle content and wind speeds, is corrected using information gathered by weather satellites belonging to the armed forces. All of these were dramatically illustrated during the last two Gulf Wars.

While the 1990s saw a total integration of space assets into terrestrial based defence systems, with the growth of dual-use systems, the military and commercial users began to share the services provided by single spacecraft. Consider, for example, remote sensing satellites. The US QuickBird satellite has a 0.61m resolution, better than its counterpart, Ikonos with a resolution of 1m. Optical satellites are constrained by weather and lighting conditions while radar sensors are independent of these factors. A similar trend is occurring in radar satellites. The resolution is improving; e.g. European ERS-1 & -2 (25m resolution), Canadian Radarsat have 25m and 9m resolutions and the new Radarsat is expected to have a 3m resolution, and a German radar satellite is expected to have a resolution of about 1m. Radar data could be used with those from optical sensors to increase their usefulness. Similar progress has been made in the capabilities of civil and defence communications and navigation satellites.

Thus, the trend now is the convergence between military and civil capabilities and applications. With these developments the need to acquire weapons to destroy satellites in orbit and missiles and their warheads in transit through space seemed urgent. The development of National Missile Defence (NMD) systems needs to be kept in mind because even before a NMD system becomes a reality, considerable ASAT capability will have been acquired.

It can be seen that the civil and defence space assets are an important element of terrestrial security making them targets during any earth-bound conflicts. It is essential to keep space as a secure environment for space assets of all space faring nations. Table 1 gives a summary of some of the countries involved in different types of applications of space. Moreover, space applications have been largely driven by military, strategic, sovereignty and prestige considerations.

3. Space weapons

Recently, with the growing dependence on civil and defence satellites for the operation of terrestrial weapons and perceived threats against these from long- and short-range missiles, considerable interest has been focused on the development of weapons to counter these. Moreover, by 1960, the US Army's proposal to convert its Nike Zeus ABM system to an ASAT role established a link between ABM and ASAT weapons.[3]

Space weapons can be broadly grouped into three categories: nuclear, non-nuclear and non-dedicated space weapons. Non-dedicated space weapons are those that do not destroy either a satellite or a missile but they destroy their command, control and space surveillance equipment that are vital to the efficient operations of spacecraft and missiles. Various space weapon systems and their deployment modes are summarised in Table 2.

ASAT weapons

Investigations of earth- and space-based weapons aimed at satellites and missiles began even before signing the Outer Space Treaty in October 1967. Essentially kinetic- and directed-energy weapons in three basing modes have been considered: ground-, air- and space-based. A problem with a kinetic energy ASAT weapon is that it takes time to reach its target. On the other hand a laser device was seen to have an advantage, as it can reach the target rapidly and it does not create a significant amount of debris. This gave considerable impetus to the investigation and development of laser ASAT weapons. For example, on 17 October 1997, a ground-based laser at two power levels was tested against an Air Force MSTI-3 satellite (420km orbit).[4] Eventually the Army and the Air Force ground-based laser programmes converged. A 1-megawatt Mid-Infrared Advanced Chemical Laser (MIRACL) was fired into space from the Army's missile test range at White Sands, New Mexico, but the test failed. However, a low power 30-watt laser used for the alignment of the system and tracking of the spacecraft was sufficient to blind the satellite temporarily. It also showed that a commercially available laser with a 1.5m mirror could be an effective ASAT weapon.[5] China and Russia also have similar programmes.

Missile defence weapons

The research, development and deployment of NMD systems began more or less in parallel with the ASAT efforts. It is important to consider NMD briefly as, even before it becomes a usable system, it will have a good ASAT capability. China, Russia and the United States are involved in developing, and to some extent even deploying, anti-ballistic missile defence systems. Israel and Japan have also been engaged in the development of short-range missile defence systems. For example, recently Japan has been considering launching its own missile early-warning satellites.[6]

From Table 1, it can be seen that there are several more states with extensive space programmes. There are more than just two states interested in developing space weapons, whether they are ASATs or NMDs. With such a development, the problem of operating in space with safety is becoming an important issue. For example, the amount of debris in some orbits is on the increase. This is addressed briefly in the next section.

4. Space debris

With the proliferation of space weapons it is likely that there will be a greater number of possible tests in space. An unfortunate consequence of this may be an increase in space debris aggravating an already dangerous situation. For example, on 29 March 2006, a piece of space debris crashed into a Russian broadcasting satellite, damaging it. Subsequently the spacecraft had to be sent into a higher orbit.[7] The first recorded collision between two spacecraft occurred in July 1996 when a French military micro-satellite (Cerise) suddenly lost stability. It was found that the stabilisation boom was damaged by a piece of debris from an Ariane booster.

As of August 2005, North American Aerospace Defense Command (NORAD) has catalogued 9,379 objects in earth orbit. Of these, 2,954 are payloads and about a third are active satellites.[8] It is no surprise that a number of close encounters between spacecraft and debris have occurred, damaging satellites. Examples of some of these are summarised in Table 3. While the list in Table 3 is not exhaustive, it illustrates the serious difficulties that could arise from collisions between spacecraft in the GSO. In the example cited in Table 3, the Fltsatcom-1 was a US military satellite.[9] Should there have been an actual collision, it might have been construed as an attack on the US. More than a third of all space objects in GSO are the result of military activities. No doubt, this will increase as more and more countries perceive the need to use outer space for defence purposes. This is an important consideration when discussing the issues related to space security.

5. Some conclusions

It is highly likely that any future NMD will affect the nuclear policies of states with nuclear weapons. For example, China may feel its nuclear weapons are impotent against US NMD thus increasing its nuclear arsenal and conducting further nuclear tests. This will result in India conducting more nuclear tests to improve its minimum deterrence against China. No doubt Pakistan will react to this thereby causing a whole new nuclear arms race to be initiated. Not only this but when an incoming weapon of mass destruction is intercepted and destroyed above the Earth's atmosphere, its lethal nuclear, chemical or biological ingredient will affect the Earth below; thus, in the end, we do not escape the effects of such weapons. Finally, even before a workable NMD is developed, we will have very effective ASAT weapons.

The civil and/or commercial applications of outer space have the potential to generate significant economic, social and environmental benefits. However, it is not certain how this potential will be realised as important players have not yet formulated clear space policies and many business firms are still working out viable business plans. Currently, existing policies and regulatory frameworks are not likely to be able to meet new challenges in the near future to support further development in commercial activities. An example is that of the export control regimes and the Missile Technology Control Regime (MTCR).

It is often argued that proliferation of space weapons and related technologies is undesirable. In the past, solutions for such questions have been found in arms control agreements. For example, the 1970 Treaty on the Non-Proliferation of Nuclear Weapons (the NPT) was achieved in order to prevent the spread of nuclear weapons. While the treaty has, by and large, been successful, the number of original five nuclear weapon states has now increased to at least eight. This occurred as retaining and to some extent improving such weapons by the five nuclear weapon states has not dissuaded others from acquiring nuclear weapons, particularly when the new states face security problems of their own. On the other hand it is sometimes argued that ASAT and defensive systems must be developed to deter an aggression from an adversary. In the case of a nuclear deterrent, states have tended to develop more weapons resulting in the proliferation of nuclear weapons. By the same logic, if space weapons are developed and deployed, it would be very difficult to convince other space faring nations not to embark on their own space weapon programmes even as a deterrent. Thus, it is very important to achieve a negotiated space arms control treaty now while sophisticated weapons are still not developed or deployed.

6. Way forward

Problems with ASAT weapons: For the above reasons, as a first step, it is suggested that a limited ASAT treaty should be negotiated. For example, a high altitude ASAT treaty is proposed. For the purpose of the treaty a space weapon is that which can damage, destroy, permanently disrupt the functioning of, or change the flight trajectory of space objects of other states.[10] An important provision would be to prohibit development, testing in space or against space objects, or deployment of any ASAT for attacking satellites with orbital periods of 12 hours or greater or minimum altitudes of 5000 km or greater. This would cover almost all the sensitive satellites as seen from Figure 1.

An important reason for an ASAT treaty like the one proposed above is that without such a measure there would be more debris generated in orbits. It is essential to resolve the issues related to space debris.

Improve transparency in outer space: As a first step to improve transparency, strengthen the compliance with the U.N. Convention on Registration of Outer Space Objects entered into force on 13 September1976. An important provision of the convention states, "When a space object is launched into earth orbit or beyond, the launching State shall register the space object by means of an entry into an appropriate registry which it shall maintain. Each launching State shall inform the Secretary-General of the United Nations of the establishment of such a registry" (Article 11.1). Moreover, according to Article IV. 1, “Each State of registry shall furnish to the Secretary-General of the United Nations, as soon as practicable, the following information concerning each space object carried on its registry: (a) Name of launching State or States; (b) An appropriate designator of the space object or its registration number; (c) Date and territory or location of launch; (d) Basic orbital parameters, including: (i) Nodal period, (ii) Inclination, (iii) Apogee, and (iv) Perigee; (e) General function of the space object.”

There are two observations one can make here. First, these obligations are mandatory. Second, by and large, provision IV.1. (e) has not been fulfilled, since nearly three-quarters of the satellites launched serve military purposes and hardly any of them have been described to the UN Secretary-General as having a military use. Thus, until the registration convention is strengthened, a way must be found to determine how the international community is using outer space. This is important, since according to the Outer Space Treaty, "A State Party to the Treaty which has reason to believe that an activity or experiment planned by another State Party in outer space, . . . would cause potentially harmful interference with activities in the peaceful exploration and use of outer space, . . . may request consultation concerning the activity or experiment" (Article IX).

It is possible to learn, with some degree of accuracy, about the missions of various satellites by studying their orbital characteristics and by scanning numerous technical and military journals. A more active measure would be to monitor the communications flow in detail. However, it may be easier to monitor the telemetry sent from the satellite to its command and control centres. An international or a multinational organisation with government support may be necessary—and more useful. Before considering this kind of international or multinational framework, it may be useful to very briefly look at the type of equipment needed to carry out some basic observations of outer space activities from the earth.

An organisation beginning the monitoring task could start with such simple type of observations as satellite telemetry. This is because it is possible to determine the mission of a spacecraft[11] and because the amount of resources required, both financial and human, is very small.[12] For example, monitoring telemetry from spacecraft would not require very sophisticated equipment. An initial simple system might consist of an antenna, a good high frequency signal receiver, a tuneable very high frequency (VHP) receiver, a spectrum display unit, a time code generator and radar, a tape recorder, a strip chart recorder, a frequency discriminator, a desk computer and a tracking system.

Improvement of space-traffic control: The current openly available catalogues of space launches are not very accurate for effective traffic control. It is not always easy to know with certainty the location of an object in orbit. Often relevant agencies do not monitor activities in space continuously but use prediction techniques to know where various objects are. The actual locations are only determined occasionally to check the predictions. Clearly this is not very satisfactory. A working group convened by the four leading non-governmental organisations dealing with space issues, the American Institute of Aeronautics and Astronautics, the U.N. Office on Outer Space Affairs, the Confederation of European Aerospace Societies and International Academy of Astronautics, has suggested more extensive efforts to improve space traffic control procedures.

As a first step, an International Data Centre (IDC) could be established, for example, in Vienna, where data provided by participating countries on space objects in orbits would be collated and compiled. This data could be, for example, the telemetry emitted by satellites, their shapes, sizes, and orbits, the launching country, and the designation of satellites. The data centres could also conduct routine analysis according to strictly defined procedures. The second step would be that the data centre could establish some equipment necessary to track objects in space. This would be to verify the Registration Convention and also data that might be available from various states on orbital debris. The latter information would be to check measures that may be used on orbital mitigation.

Orbital debris mitigation*:* To control the production of debris, the Inter-Agency Debris Coordinating Committee (IADC) consisting of space agencies from China, France, Germany, India, Italy, Japan, Russia, Ukraine, the United Kingdom and the United States, as well as the European Space Agency, has drawn up a set of guidelines. However, these are not legally binding. In any case, so far, Russia and India have blocked the U.N. Committee on the Peaceful Uses of Outer Space (COPUOS) from adopting the guidelines. As a next step, the concerns of these two states should be seriously discussed in order to achieve their support. It might be suggested here that the COPUOS adopts a possible "Convention on Limiting and Eliminating Debris in Orbits (CLEDO)". The verification of such a convention could be carried out by the above proposed International Data Centre.

Table 1. Summary of different types of satellites used by various countries.

Country	Indigenous Launch Vehicle	Early-warning satellites	Communications satellites		Navigation satellites		Meteorological satellites		Observation satellites	
			D	C	D	C	D	C	D	C
China	√	√	√	√	√	√	√	√	√	√
Europe	√		√	√	√	√	√	√		√
France	√		√	√	√	√	√	√	√	√
India	√			√		√		√	√	√
Israel	√								√	√
Japan	√			√		√	√	√	√	√
Russia	√	√	√	√	√	√	√	√	√	√
USA	√	√	√	√	√	√	√	√	√	√

D: Defence C: Civil

Table 2. Various types of space weapons

Weapons						Status
	Deployment mode (3)					
Type	Ground-space	Space-space	Space-air	Space-ground	Air-space	
Nuclear Endo-atmospheric	X(1)					Existing
Exo-atmospheric	O(2)					Existing
X-ray laser	O	O(3)	O(3)	X(3,4)	O	Theoretical
Non-nuclear Projectiles (e.g. KEW, US F15 MHV, Russian ground-based missiles) (b)	O	O	O	O	O	Investigated; Russian direct ascent reportedly deployed
Neutral particle beams		O				Investigated
Lasers	O(5)	O	X(3)	X	O	Investigated
Radio-frequency weapons	O	O	O	O	O	Investigated

Key

X = ballistic missile defence only

O = ballistic missile defence & ASAT capabilities

1 = essentially ground-atmosphere

2 = possible electromagnetic pulse weapon

3 = 1967 Outer Space Treaty bans deployment of nuclear weapons in orbit

4 = mainly for upper atmospheric applications

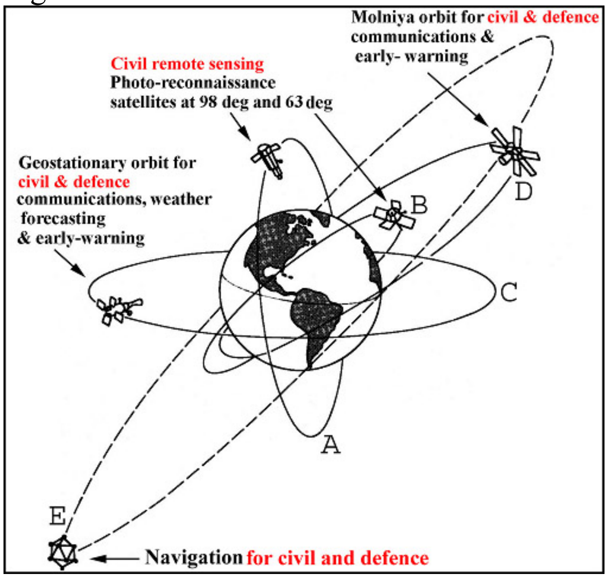
5 = laser deployed preferably on top of mountains

(b) MHV = miniature homing vehicle

Table 3. Close encounters or collisions in Earth orbits.

Satellite name	**Date of collision/close encounter**	**Damage**	**Safety measure**
US Fltsatcom-1	4 May 1980	Predicted distance from DSP-F4 satellite was 9.4km and reduced to 3.5km a few days later	Fltsatcom-1 performed an evasive maneuver
US Fltsatcom-1	During 2nd half of 1981	Eight close encounters with US SBS-1 satellite, five between 2.6km and 6km; and five encounters with four other satellites	Collision avoidance maneuvers performed
Cerise, a French military micro-satellite	July 1996	Stabilisation boom damaged by debris from Ariane booster	Regained attitude control by reprogramming the payload
CRISTA-SPAS-a communications satellite	12 August 1997	Passed very close (3.1km) to an old rocket motor from 1984 Shuttle	Failed to reach the GSO
Russian Mir station	15 September 1997	US satellite MSTI-2 passed close (~500m)	Mir not maneuvered
Russian Mir station	28 July 1999	Close encounter with a rocket body	Mir not maneuvered
Several Shuttle missions: STS-44, -48, -53, -72, -82			In each at least five maneuvers were carried out
International Space Station (ISS)	26 October 1999		Altitude raised to avoid close encounter with a satellite rocket
ISS	28 March 2002	Passed within 14km of a Delta 2 rocket	ISS maneuvered to avoid collision
Russian broadcasting satellite	29 March 2006	Punctured by a debris	Satellite put into higher orbit & deactivated

Figure 1. Different satellites in various orbits.



Key to the above figure:

Satellite	Altitude (km)	Orbital inclination	Type of orbit/Period (min)
Reconnaissance and remote sensing:			
Optical	180 - 530	62°, 72°, 82°, 97°	A/~89
Electronic	480 - 650	74°, 82°, 97°	A/~100, B/~100, D/~700
Ocean surveillance	250 – 1,100	~65°	B/~90
Early warning	36,000	0°	C/~1440
	688 x 39,000	63°	D/~700
Meteorological	36,000	0°	C/~1400
	610 – 900	81°, 98°	A/~100 and B/~100
Communications:			
US SDS and DSCS	250 x 39,000	64°	D/~700
US FLTSATCOM and Milsat	36,000	0°	C/~1440
Molniya	400 x 40,000	63°	D/~700
Cosmos	1,400	74°	D/~700

Notes

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[3] Peter L. Hays, "United States Military Space Into the Twenty-First Century," USAF Institute for National Security Studies, Occasional Paper 42 (2002), p.85, <http://permanent.access.gpo.gov/lps4417/www.usafa.af.mil/inss/OCP/ocp42.pdf>.
[4] Michael A. Dornheim, "Laser engages satellite, with questionable results," *Aviation Week & Space Technology* vol. 147, no. 17 (27 October 1997), 27.
[5] Geoffrey E. Forden, "The Airborne Laser," *IEEE Spectrum* 34 (September 1997), 46.
[6] Taylor Dinerman, "Is the Japanese-US missile defense program changing the Asian military balance?", *The Space Review*, 10 April 2006, <http://www.thespacereview.com/article/594/1>.
[7] P. Marks, "Space weapons could make orbit a no-fly zone," *News Scientist* 189, (15 April 2006), 30-31.
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[11] G.E. Perry, "The Cosmos Programme," *Flight International*, 26 December 1968, pp.1077-79; and "Recoverable Cosmos Satellites," *Spaceflight*, Vol. 14, 1972, pp.183-84.

[12] Bhupendra Jasani, "Restricting Anti-satellite Technology," in Joseph Rotblat and Sven Hellman, eds., *Nuclear Strategy and World Security: Annals of Pugwash 1984*, (London: MacMillian, 1985), pp.107-123.

Toward a Future European Space Surveillance System: Developing a Collaborative Model for the World

Xavier Pasco

In recent years, the operational and technical merits of having a European space surveillance system have been intensely debated—and quite rightfully. Not surprisingly, a new awareness has emerged in Europe concerning the management of orbital debris. In the same vein, projected ever-increasing orbital traffic and the necessity of adopting better rules and regulations have contributed to this nascent interest. Within the framework of European political objectives and concerns, the more general merits of such a system have been much less apparent in the debate. Still, a brief overview of the benefits for Europe of engaging in such an undertaking shows how much it could both benefit from past European experience in technology pooling and how it could use this process to consolidate a genuinely "European" political-security awareness.

Defining the Challenges

Any analysis of the challenges implied by a collective space surveillance system must first address the following issue: how widely can space resources be shared worldwide given the fact that these resources (technological and financial competencies) are very unevenly distributed among nations today? This starting point does not naturally lead toward the notion of collective security in space. While any collective security system necessarily means reaching a high level of mutual trust, the very fact that the technical tools for consolidating mutual trust in space are concentrated in a very few countries does not argue for rapid progress in this field.

Some Past Experiences

Taking into account this fact of life, establishing more widely distributed space system surveillance capabilities could both create more trust and create a means for pooling resources, thus inverting the usual trend in space. In this respect, thinking about the political merits of sharing resources to enhance collective security in space is not so different from what happened in the field of remote-sensing satellites, which have contributed significantly to the maintenance of international peace in dangerous periods and which are now proving to be among the most dynamic multinational initiatives for dealing with worldwide environmental problems. This has been particularly true in the case of Europe, where comparing remote sensing with space surveillance raises some useful points. Indeed, a parallel can be drawn between today's challenge of building a shared surveillance system and what has happened since 1999 among the six states that decided to come up with a common satellite observation system for defense and security. The current objective of joint space surveillance is very similar to the past challenge of devising a multilateral military observation satellite architecture based on shared needs: called the *Besoin Opérationnel Commun* (Common Operational Requirements) or BOC. Its first objective was to use existing systems (or those projected in the short term)[1] in a coordinated fashion, while the second phase will lead these same countries to step up their cooperation and define in common a future satellite architecture that will answer European needs. This so-called second-generation system shows how such a sensitive issue (since it usually deals with national military intelligence) can be the subject of a cooperative multinational policy if the proper policy and institutional framework has been established. While a space surveillance system would be directed toward the stars instead of the Earth, the useful experience of developing mutual trust as demonstrated among the BOC countries could thus be proposed as a theoretical model for setting up a commonly agreed multinational data policy, including the dual-use requirement issues that will likely be attached to such a system.

Agreeing on Security Trends

Preparing for such a possibility requires having a minimal mutual understanding of the main security trends for the coming 30 to 40 years. Some of them are outlined below.

For example, consistent with the greater expected access to and use of space by an increasing number of players, space traffic management may soon emerge as a first-tier security issue. Either the increasing number of satellites or new techniques used for better performances in low-Earth orbit (such as new constellations or formation-flying satellites[2]) could pose new challenges in term of collective security management. The development of "rules of the road" may be necessary to regulate and defuse any misunderstandings.[3]

The very nature of the players in space—be they traditional states, new private actors, or non-governmental organizations—may also experience a transformation in the medium term. Current suborbital activities run by private firms, the possible expansion of space tourism at some still undetermined level in a near future, or fundamentally new activities initiated by evolving end-user communities could contribute significantly to this transformation and create a greater appetite for increased transparency and for improved security guarantees in space. One can also expect increasing reliance on space systems for improving the security of citizens at a time when space technologies will be increasingly integrated into complex, global information systems. Europe, in particular, has announced that it will step up the role of space in its security research policies. In this respect, the process aiming to improve common procedures has already been started from the perspective of a common civil security architecture and for a more efficient "homeland security" approach as it relates to terrorism or to possible natural or industrial disasters.

All these evolutions highlight the fact that space applications will play an increasingly important role in the day-to-day life of our societies. Consequently, the value of these systems—politically and socially, as well as economically—will increase in the coming years.

Europe as a "Testbed"

These main trends are now largely accepted and could easily serve as a framework for global efforts to put the space surveillance capabilities at the top of the list for future investments in space. Indeed, in Europe, space surveillance seems to fit naturally into the broader "space for security" picture. At the regional level, undertaking such a new mission makes sense. Basically, three reasons can be presented to support this view:

- As seen from the European side, engaging in such a project can only promote the idea that Europe is actually building and assuming its own political identity as a legitimate international actor. As seen from the member states, garnering support inside Europe for a collective security project would undoubtedly put Europe in a better position to demonstrate greater political maturity by projecting a more positive image of its on-going efforts to develop a "Common Foreign and Security Policy" (CFSP).

- Such an undertaking would also reflect past positive experiences in the European integration process. A number of its successes have indeed relied on commonly agreed, highly strategic R & D endeavors as demonstrated by the histories in the field of nuclear physics of the European Organization for Nuclear Research (CERN) or Euratom. It is now well documented how much these projects and institutions have affected historical steps toward European political integration.
- Last, but not least, such topics appear very much in accordance with the current strategic orientation of Europe in the field of security. While the European Security and Defense Policy (ESDP)[4] remains a work in progress, largely due to national differences regarding the nature and role of the European military forces, more security-oriented projects and plans dealing with "the security of the European citizens" may prove to be more efficient in linking national policies under a widely accepted, overarching European goal. Space surveillance could be considered as a central part of this "softer" security orientation and would then prove compatible with processes

> already at work in European security policy more generally.

Again, it must be noted that any collaboration aiming at a global space surveillance system will face national reservations, maybe even resistances, given the sensitive nature of the data. Two aspects should be mentioned here. First, the sensitivity of the data and activities possibly undertaken in this field cannot be considered to be an insurmountable obstacle. As mentioned already, the growing collaboration among military forces and intelligence agencies worldwide, and, more specifically, in Europe, when it comes to protecting our societies against terrorist acts, suggests that there are fruitful possibilities for expanded cooperation in space surveillance. Second, Europe has prior positive experience in pooling space resources from different countries as demonstrated by the European Space Agency (ESA). Converting national tools or capabilities into regional assets managed by European institutions has been at the heart of ESA's institutional life since the seventies in Europe. Building a cooperative space surveillance system appears to be a relatively workable objective from this point of view.

Technical Expertise

In the particular field of space surveillance, a number of European states have already been gathering technical experience through a variety of different projects. These include the radar programs in France (the ground-based, bi-static GRAVES radar and the ARMOR naval radars aboard the tracking ship *Monge*), the German FGAN-TIRA imaging radar, and various telescopes spread across several locations in Europe.

Capitalizing on these experiments, Europe can legitimately think of building an expanded capability to allow for a genuine space situational awareness capability. Given the future space security challenges mentioned above, the following functions might be proposed as a baseline for such a system:

- knowledge of orbital parameters;
- prediction of transit routes for the deorbiting of space objects to the Earth's surface;
- recognition of new objects in orbit (depending on the cataloguing capability performed, for example, by the French GRAVES radar);
- recognition of maneuvers by spacecraft;
- collision prediction and avoidance capabilities (especially for larger constellations or formation-flying satellites); and
- identification of satellites for legal attribution in case of damage caused to other spacecraft.

Each of these elements directly addresses the commonly agreed security challenges mentioned above, and they may grow as the future space "landscape" involves new entrants in space activity (either new states or private actors).

A first study was already presented in 2005 by a consortium formed under the leadership of the French ONERA (*Office National d'Etudes et de Recherches Aéronautiques*, which built the GRAVES bi-static radar).[5] This study suggested the feasibility of 98 percent coverage of low-Earth orbit to an altitude of 1,700 km by 2010, while geo-stationary orbit coverage could reach 95 percent by around 2015. Such a system would involve the development of three or four sites distributed globally. ESA should be in a position as soon as 2007 to promote further studies toward such a system.

Developing this network would present a number of technical and operational challenges, including the maintenance of a catalogue of orbital objects and provision of a genuine analytical capability. Any survey or cataloguing strategy requires repeated and constantly updated observation of space objects to secure correct orbital data, to identify un-catalogued objects, and to distribute observational responsibilities for the maintenance of the catalogue and the identification of maneuvers by spacecraft. At the European level, using cooperative technical solutions and strategies would pay off very quickly by offering participating states improved data collection, which in turn can provide better space management capabilities and even better security assessments.

Given the increased space activity expected in the years to come, having a cooperative system on a regional scale can be seen as a valuable contribution toward a space surveillance system distributed on the world scale. From a practical point of view, such a contribution could obviously only be envisioned once monitoring assets and cataloguing capabilities in Europe are fully operational. To date, this activity has been considered (and financed) on an experimental basis only. By contrast, in the United States and Russia these kinds of capabilities have been used in an operational mode for decades due to their ballistic missile early-warning function.

Still, even if they are at a nascent stage right now, such capabilities would certainly make the most of the powerful "resources pooling" institutions that exist in Europe. Of course, this assumes that the collective political will exists to sustain the project. This is certainly not the least of the challenges. But precisely one merit of this undertaking would be the real opportunity for Europe to develop a model for cooperative action that might be applicable worldwide in an era where global issues will require renewed creativity to garner greater collective support from individual countries.

Notes

[1] This agreement aims to allow better use of the existing French Helios satellites through coordination with the upcoming German SAR Lupe military radar satellite, the Italian Cosmo-Skymed dual radar satellite, and the future-generation French Pleiades dual-purpose satellite.
[2] In the case of constellations, a large number of satellites may be distributed widely in one or in several orbits, thus increasing the absolute number of space systems orbiting the Earth. In the case of formation-flying techniques, one function usually performed by one space platform may now be performed by several smaller platforms orbiting together (so they can communicate) with globallly improved performance. In this latter case, a new challenge consisting of managing not one but several satellites simultaneously is obviously involved.
[3] See Corinne Contant-Jorgensen, Petr Lala, and Kai-Uwe Schrogl, *Cosmic Study on Space Traffic Managemen*t (Paris: International Academy of Astronautics, 2006). This study is available online at: <http://iaaweb.org/iaa/Studies/spacetraffic.pdf>
[4] The ESDP aims at creating a common defense as envisaged in the Maastricht Treaty. As such, the ESDP is a subset of the larger Common Security and Foreign Policy.
[5] T. Donath, J. Laycock, T. Michal, P. Ameline, and L. Leushacke, "Proposal for a European Space Surveillance System," European Space and Technology Centre, 2005.

The Future of U.S.-European Space Security Cooperation

Tomáš Valášek

The U.S. administration's slow march toward weaponizing space over the past several years has spawned a number of projects and initiatives, mostly clustered around non-governmental organizations (NGOs), aimed at developing a new regime for preventing the deployment of weapons in space. At approximately the same time, across the Atlantic, a parallel space security community has formed, albeit with a slightly different focus: studying the potential use of space within the new collective security and defense policy of the European Union (EU). This community's growth has been spurred by the EU's recent entry in the realm of defense and security, which has given Europe's traditional space projects a new purpose and dimension. While the two space communities, European and American, naturally share an interest in the last frontier, it is less clear whether they have common aims. From the perspective of U.S. NGOs, the question arises: could European think-tanks and governmental organizations be an ally in preventing the weaponization of space?

The purpose of this paper is to assess whether the space arms control proposals made by U.S. NGOs, such as the Federation of American Scientists, the Henry L. Stimson Center or the Center for Defense Information, have been received positively by the

European space community and whether they could constitute a good starting point for U.S.-European cooperation. To gauge the views and feelings on the European side, the author has surveyed the views of key thinkers in Europe on issues of space security. Their responses form the backbone of the argument laid out in this paper.

This study will seek to answer three key questions that frame the debate on potential U.S.-European cooperation on space security. First, what are the key defining features of the U.S. space security proposals? Second, how do those features resonate among key European thinkers on space and security? And, third, where their views overlap, what is the best platform for cooperation between U.S. NGOs and the various European actors?

The U.S. Space Security Community: NGO-based and Focused on the Threat of Weaponization

When one looks at what the current U.S. proposals on space security have in common, several key points emerge.

First and foremost is a *shared sense of threat*: a belief that the current U.S. government's space policy, unless changed, will eventually lead to the deployment of weapons in space, which would constitute a grave threat to security in space and on Earth. As Theresa Hitchens of the Center for Defense Information writes:

> Over the past several years, it has become ever clearer that the United States, under the administration of President George W. Bush, is on a pathway to becoming the first nation to deploy space weapons. The consequences of such a major shift in U.S. policy … for international security are likely to be deeply and broadly negative.[1]

The same assessment is broadly shared by the Center for International and Security Research, the Stimson Center, and others.

A second point of convergence among U.S. NGOs is their *chosen means* of halting the march toward the weaponization of space. They all eschew traditional arms control agreements and UN treaties. Instead, proposals floated to date focus on lower-level, technical approaches, such as measures to map and reduce satellite-killing debris in space, steps to reduce the risk of collisions in space, and notification regimes to avoid or announce in advance dangerous maneuvers in space. John Steinbrunner of the University of Maryland justifies this approach in technological terms, arguing, in effect, that the dual-use nature of weapons that could be used for space warfare makes it impossible to effectively separate them from the overall arsenals. In other words, it is better to assume that most space assets could be used for offensive purposes and focus on monitoring and regulating the movement of all assets rather than trying to prevent the deployment of malicious ones.

While his point is valid, there is at least one additional if less often articulated reason for the avoidance of traditional arms control treaties—namely a cold, realistic view of the fate that such treaty would meet in the U.S. Senate (at least until the November 2006 elections). The earlier, Republican-dominated Senate had already rejected a host of arms control treaties going as far back as the Clinton administration. Many of the U.S. NGOs simply concluded that there was little point in pursuing a treaty banning weapons in space when it did not have much chance of passing the Senate. Now, the main obstacle is the White House. Just to dispel any doubts about its position, John Bolton, the then-Undersecretary of State for Arms Control (now U.S. ambassador to the United Nations), has stated regarding the Bush administration's view on negotiating a treaty on preventing arms race in outer space: "We just don't see that as a worthwhile enterprise."[2] This view is supported by the 2006 U.S. National Space Policy.

A third point of convergence among U.S. NGOs is a belief in the *influence and power of non-governmental groups*, namely that they themselves have the tools to initiate a grassroots movement and to eventually force new rules on use of space. Theirs is an activist stance born out of decades of positive experience with shaping the debate on nuclear arms control. More recently, the 1997

Convention on the Prohibition of the Use, Stockpiling, Production, and Transfer of Anti-Personnel Mines and on Their Destruction further reinforced the idea that a concerted, long-term grassroots campaign can change the behavior of governments on a global level. While only governments can sign and enforce new treaties, rules, and codes of conduct, non-governmental groups can and have in the past been able to put pressure on governments and to name and shame them into action. This is a belief that underlies current U.S. NGO action on space security.

European Views on U.S. NGO Space Security Proposals

Key European actors in the space debate surveyed for this study tended to express a quite different view from that articulated by U.S. NGOs. On the key issue of *threat*, European respondents, in a reversal of the usual U.S.-European dynamic, largely reject the U.S. NGO's sense of concern about the Pentagon's space policies. U.S. space plans are often viewed in Europe as not mature enough to warrant significant attention. To the extent that European and U.S. space actors do share a sense of worry, it concerns non-military threats, such as debris and poor situational awareness in space. On the military side—that is, the threat posed by U.S. and other governments' weapons programs—there is little unity among European think-tanks and governments. "[The issue] is not yet in the public sphere—space policy doesn't have that kind of support or exposure in Europe," one respondent wrote. "[The debate] exists only amongst space insiders."[3]

More importantly, however, the space security debate on the two sides of the Atlantic differs in focus. Most think-tanks in Europe as well as the European governments and institutions are spending as much if not more time and energy on studying ways to *expand* military uses of space. They are busy improving European cooperation regarding military space assets, and putting a new and more sophisticated generation of European military and dual-use assets in space. This debate, rather than any plans made in the Pentagon, occupies most of the time and energy in Europe's corridors of power. As one European analyst wrote: "Europe is much more preoccupied both by its own application programs for civil, dual, and military purposes, and possibly by the issues of debris (...). Weaponization is really not on [Europe's] radar screen."[4]

Arms control NGOs, such as the U.K.-based Acronym Institute, form an important exception to this general rule, and there are signs of the European Parliament stirring into action against the weaponization of space. In 2005, the Parliament commissioned a study from the Acronym Institute on the subject. Politically, however, the question of Pentagon space plans and their potential effects on security has yet to ignite Europe. The general sense seems to be that as a threat, U.S. space plans are not necessarily convincing and certainly not imminent.

Whether the unease in Europe will solidify in the near future may be partly foretold by the forthcoming European Parliament's report on space security, which is likely to take a fairly critical stance on U.S. space policy and may launch a more vigorous debate than what we have seen to date. But, for the time being, the focus in Europe on expanding, rather than curbing, the use of space for military purposes limits the amount of time and energy that European governments and think-tanks spend on pondering U.S. arms control proposals.

Answers to the question of *chosen means*—i.e., whether the low-level approach currently championed by U.S. NGOs is also favored by Europeans—produced a few unexpected answers. Even though most European see U.S. policies through a less dramatic lens than their U.S. counterparts (which one might expect to lessen their zeal for any space regime), interest in Europe in a space "code of conduct" seems genuinely strong. This holds true despite the often-assumed European preference for formal arms control treaties.

For various reasons, both sides of the Atlantic seem to have found a common ground in their focus on technical, low-level agreements. From the European perspective, the code of conduct proposed by U.S. NGOs does serve European interests in a number of ways perhaps unintended by its authors. For instance, better space situational awareness—a central part of the U.S. NGO proposals—also means more security for current and future

European satellites, whether civilian or military. There does seem to be genuine, if not unlimited, room for transatlantic cooperation on a number of proposals put forth by U.S. NGOs, particularly where they lead to safer and more predictable use of space: one, which—from the European point of view—diminishes the risk to current and future European space assets.

On the last point—the *role of non-governmental groups* themselves as a potential platform for U.S.-European cooperation—the respondents generally reacted positively. Europeans recognize that as far as attempts at crafting a space security architecture are concerned, NGOs are in many ways their most viable partner on the U.S. side by the virtue of the amount of research invested in the various proposals and their links to other potential allies in Washington within the political arena. The relative weakness of the official EU-U.S. security dialogue also tends to work in favor of the non-governmental route, as does official Washington's current disinterest in pursuing multilateral approaches to improving space security.

At the same time, there are limits to this cooperation. It works as long as both sides are in the stage of collecting ideas and drafting model agreements. At some point, when the need arises to move from ideas to official policies, one problem in particular will emerge. In the United States, any attempt to put an official stamp on the ideas currently circulated in books and conferences would expose the gap between official and non-governmental positions. There is simply no getting around the fact that the Pentagon and the White House are headed in a direction quite different from where the Center for Defense Information or the Stimson Center would like U.S. space policy to go.

Conclusions

As evidenced by a number of productive transatlantic meetings on space security, low-level cooperation between U.S. NGOs and Europe is alive and well. Both sides share a sense that it is important to improve security in space, and both agree that low-level technical agreements are the way to go for the medium-term future. Equally, both sides seem content to cooperate somewhat asymmetrically at this point, with the U.S. being represented mainly by NGOs and Europe by a mix of think-tanks, advocacy groups, national governments, and EU institutions.

Were the debate to become politicized—i.e., were the actual deployment of U.S. space weapons to become a pressing issue—the European camp could suffer from divisions between those groups favoring greater use of space for security purposes and arms control groups. Similarly, were any of the EU institutions to adopt a formal, treaty-based approach to space arms control, it would likely lose close support from the U.S. NGOs, on tactical grounds. This point, however, may be changing since the November 2006 U.S. elections.

For the sake of productive day-to-day cooperation, European institutions and governments must keep in mind that a few degrees of separation divide the U.S. NGOs from their government, which, in turn, dictates patience when moving space security ideas from the academic to the political worlds. The U.S. NGOs, for their part, would benefit from a closer and better grasp of the European institutional landscape and the motivations of the various actors. This, in turn, would produce a more finely tuned strategy when crafting plans for approaching possible allies on the European side.

Notes

[1] Theresa Hitchens, “U.S. Weaponization of Space: Plans and Implications,” October 21, 2004, <http://www.cdi.org/program/issue/document.cfm?DocumentID=3191&IssueID=76&StartRow=21&ListRows=10&appendURL=&Orderby=DateLastUpdated&ProgramID=68&issueID=76>.
[2] John R. Bolton, Press Conference at the U.S. Mission to the United Nations, September 10, 2004, <http://www.state.gov/t/us/rm/36104.htm>.
[3] Correspondence with the author; source asked not to be identified.
[4] *Ibid.*

Russian Perspectives on Space Security

Victor Mizin

In the opinion of the Moscow's political and military elites, few domains have contributed as much to the grandeur and fame of Russia as space exploration. On par with Russia's nuclear weapons and its military missiles, space is considered to be the most representative demonstration of the country's technological prowess and general political clout. As a pioneering space power and successor to the Soviet Union, the Russian Federation is highly concerned about maintaining the reliability of both its military, commercial, and civilian space capabilities. Despite political upheavals and occasional lack of funding, Russia is trying to consolidate its role as a leading space-faring nation while preventing other world powers from asserting their strategic supremacy and dominating commerce through the use of the outer space and related technologies.

Forty-five years after the historic flight of Yuri Gagarin, Russia's posture on space policy issues is still driven by a two-pronged motivation: 1) to promote a framework for unhindered space exploration, hopefully in cooperation with other key actors; and 2) to preserve space as a sanctuary safe from dangerous weapons. Thus, Moscow is vitally committed to the goals of space security: equitable, sustainable, and secure access to and the use of space, and freedom from space-based military threats. As Russian military capabilities have shrunk in the post-Soviet era, notwithstanding recent cash infusions, space security problems are becoming central to the country's strategic considerations as Russia seeks to prevent its possible loss of its slim remaining strategic advantages over perceived adversaries.

This paper briefly reviews the history of Soviet space activities and Russia's reemergence as a major space actor since its near collapse in the 1990s, focusing especially on past military and current commercial and civilian space activities. It then examines Russia's policies on space security and the prospects for accomplishing its over-arching goal, which remains the preservation of a weapons-free space environment.

The Soviet Legacy and the Current Status of Russian Space Activities

Historically, Russia has towered over other countries as the first established space power. Its leading space scientists— Konstantin Tsiolkovsky, Yuri Kondratyk, Friedrich Tsander, Mikhail Tikhonravov, Vladimir Chelomei, and Sergei Korolev—made important contributions to establishing the ground rules of cosmonautics.

Currently, Russia, the United States, and a united Europe remain the key players in space use and exploration. But Russia's continuing role after its tremendous space decline since the 1991 Soviet breakup raise two main questions: what are the prospects for the future development of Russia's space industry, and what are the ramifications for arms control and nonproliferation policies?

We can trace Russian assets and ensuing postures on space security issues by dividing the Russian space endeavor into three major phases. The first ran from the dawn of the space era to the demise of the USSR and marked the height of Soviet space glory. The second largely coincided with the tumultuous but liberating years of Boris Yeltsin's rule as Russian president, but with all of the associated difficulties of the reform process. The third period began with the advent of the new Russian administration under President Vladimir Putin and is characterized by new efforts at both consolidation and revival.

Although an offshoot of the crash program to create intercontinental ballistic missiles (ICBM) for nuclear deterrence against the "imperialist" West, the Soviet space program became an independent project of great political importance.[1] Its main aim was less the task of conquering a new environment for humanity than to display to the world the technological and scientific advantages of Soviet communism. The Soviet Union under Nikita Khrushchev was eager to boast world firsts in ICBMs, space launchers, artificial satellites, manned spaceflight, Moon probes, spacewalks, and space stations. These accomplishments were made possible by using Soviet-style management of the economy to concentrate resources and undertake crash programs to quickly form a national missile and space technology complex. Space endeavors became one of the most important venues of competition with the main Soviet adversary and nemesis: the United States. Moscow even mimicked American technological solutions, as seen in the Soviet version of the U.S. space shuttle, the automatically piloted *Buran*, built to fight this alleged new U.S. space "weapon."

The Soviet Union was also quick to grasp the military advantages of space.[2] It followed the U.S. lead in such military-related applications as targeting, remote sensing, navigation, communications, early warning, and reconnaissance.[3] The Soviet Union successfully contested U.S. plans for the weaponization of space and, in certain periods, even led the space arms race. Thus, from the mid-1960s it experimented with non-nuclear, co-orbital *Istrebitel Sputnikov* (or "satellite exterminator"). These anti-satellite (ASAT) weapons were capable of closing in on enemy satellites and destroying them. These first space-to-space combat systems were tested from 1968 to 1982, although most of the time they remained in mothballs near the launch pad. The system was decommissioned in 1993.[4]

Other types of Soviet ASAT weapons that were researched, but not manufactured, included an interceptor launched from a MiG-31 aircraft that would release a small missile.[5] According to Western experts, the Soviet Union also followed the U.S. lead in researching ground-based laser ASAT capabilities at the Sary Shagan anti-ballistic missile (ABM) test site (now in Kazakhstan) and at the Nurek space tracking facility (now in Tajikistan).[6]

In addition, the USSR created the first Fractional Orbital Bombardment System, the only orbiting military nuclear weapon system ever developed. However, the system was never tested with a nuclear weapon or in orbits approaching the United States. The Soviet Union also tested the Almaz family of military space stations, primarily intended for reconnaissance missions. This was the Soviet response to the unrealized U.S. Air Force plan for a Manned Orbiting Laboratory and the alleged military missions of the Gemini, Apollo, and the space shuttle systems.[7] Finally, the Soviet Union had nurtured hopes of developing on a crash basis the 80-ton, laser-weapon-equipped Polyus-Skif-DM space station as an answer to the U.S. "Star Wars" program. But it failed to reach orbit due to an attitude control problem on its first launch on May 15, 1987, and the program was eventually aborted during the Gorbachev epoch.[8] However, fear of such systems was used by U.S military counterparts to persuade Congress and the American public that "Soviet military space capabilities pose an ever-increasing threat to U.S. land, sea, and air forces and U.S. space missions."[9]

At the same time, the Soviet leadership was aware that the benefits of space weaponization might be precarious. This led them to adopt rules restricting or banning certain types of space activities, including the ABM Treaty signed with the United States in 1972. Despite its history of weapons research, the Soviet Union was generally reluctant to deploy space-based weapons, preferring to confine its efforts to covert ground-based research and design programs. Space weaponization was avoided due to tacit mutual comprehension of the detrimental effects such systems would have on arms race stability and bilateral relations. After the breakup of the Soviet Union, weapons-oriented research and development were reportedly cancelled, coincident with the general and sharp decline in the military-industrial complex.

After 1991, Russian space and missile-manufacturing entities emerged as an "independent" and imperfectly "privatized" sector of Russia's dilapidated military industry. Given the collapse of state orders, these enterprises attempted to survive mainly through foreign contracts. The general laxity in government enforcement of export controls and the rampant corruption persistent throughout Yeltsin's presidency made such transactions possible. The danger inherent in these trends was exemplified by the Indian cryogenic booster deal, wherein certain Russian government agencies tended to act along the well-known Soviet pattern of assuming that no one would notice and trying to quietly avoid international restrictions.[10] Instead, the Indian deal established new limits to Moscow's behavior, as the U.S. government formally accused Russia of noncompliance with the norms of the Missile Technology Control Regime (MTCR). Eventually, Russia's commitment to strengthen ties with the United States and its aspirations in the initial Yeltsin years to gain the status of a "strategic ally" of Washington forced Moscow to drop the Indian deal.

Positive incentives in the U.S. approach allowed Russian enterprises to enter the world market for commercial space launchers. By permitting Russian aerospace companies to launch satellites with the U.S. technology and, most importantly, by assuring Russian participation in the *International Space Station* (*ISS*), Washington managed both to strengthen export control compliance among Russian aerospace companies and help provide needed space technologies and expertise for the *ISS*'s development. The historic decision to cancel the promising Indian deal thus ultimately saved Russia's ailing space industry, though potential launch contracts were now restricted by special anti-dumping quotas. The settlement also began the preparatory process for Russia's full-fledged membership in the MTCR, which it joined in 1995.[11]

The dramatic decline of Moscow's space programs precipitated Russia's switch to its current role as mainly an international provider of high-tech space solutions and hardware. Russia was forced to abandon a planned space station project (a follow-up to *Mir*) and to focus only on its *ISS* participation. This proved fortunate. When the U.S. space shuttle fleet was grounded after the February 2003 loss of the *Columbia*, Russia's Soyuz-TMA capsule was the only means of ferrying astronauts and cosmonauts to and from the *ISS*.[12]

But the direct contribution of the *ISS* to Russian space revenues is rather small. The main funding for Russian space activities comes from commercial launches of satellites and the sale of rocket engines. Regular launches of Western satellites allowed the Russian space agency (Roskosmos) to collect up to $800 million dollars annually in the 1990s. The fact that Russia emerged from the Soviet era with the enviable array of space-launch vehicles and top-notch engines to place payloads into almost any orbit, ironically, enabled Moscow to play a key backup role in ensuring U.S. civilian and military space access over the past decade.

Past cooperative projects, however, were not always helpful in keeping Russia space capabilities viable. Yuri Koptev, the head of then-Rosaviakosmos, lamented in June 2001 to the Russia Duma that 68 of the country's 90 orbiting satellites were near or at the end of their service lives. Many of the military's 43 satellites were simply too old to be considered reliable. Russia's civilian space budget of $193 million covered only half of the agency's needs. The Russian Federation's GLONASS satellite navigation system also was deteriorating, as only 14 of the 24 satellites required for the network to function fully were operational in 2001 (17 are now in service with a full complement planned for 2008).[13]

In 2001, attempting to halt the decline of its space capabilities, Russia re-established the Military Space Forces as an independent branch, consolidating all military space programs and assets of the country as well as coordinating commercial ventures. Still, the Russian Federation's space program, including its early-warning satellite network, continues to be plagued by underfunding and aging hardware.

In order to help support its space programs, Russia has focused on furthering its commercial launch prospects by developing more sophisticated, cost-effective technologies and cultivating its international partnerships. Thus, collaboration with NASA and the European Union remains a crucial condition of space industry survival, even with Russia's growing wealth from oil and gas.

Among other projects, the European Space Agency (ESA) and the Arianespace commercial launch consortium signed a broad launch-cooperation agreement with Russia in January 2005 on the use of Russia's Soyuz rocket by Europe, as well as a long-term agreement on the co-development of future launch vehicles.[14] Russia and ESA have built a launch pad for the Soyuz rocket at Europe's Space Center in French Guyana. Its first launch is scheduled for 2008.

Europeans are still debating joining the Russian project for a new six-person, reusable winged spaceship, the *Kliper*, to be launched by the Russian Soyuz-2 booster, which will eventually replace the existing Soyuz capsule and could deliver cosmonauts into Earth orbit and, potentially, to the Moon and Mars. Russia also helped China to launch its first "taikonauts," as Beijing's space program is based on replicating proven Russian technologies, albeit with some additions. A Moon expedition is now being jointly planned with NASA (though some disgruntled voices in Moscow argue that a recently oil-rich Russia could sustain this endeavor on its own).[15]

Europe's Centre National d'Etudes Spatiales and Russia have signed an agreement on joint development of the new 400-ton Proton (or "Ural") booster to fill the niche between the Ariane-5 and

Soyuz.[16] Soyuz will lift medium payloads and provide Europe with a manned spaceflight option. Russia's giant Energiya space corporation has unveiled plans to build a permanent base on the Moon within a decade and to start mining the planet for Helium-3 by 2020.

In terms of its finances, Roskosmos had a budget of only $590 million in 2004 yet executed 43 percent of global satellite launches of satellites, more than any other country.[17] In 2006, it expected to increase its budget to $690 million to catch up with India's space budget (but not with China's or Japan's).[18] The 10-year Federal Space Program for 2006 to 2015 envisions a total budget of 305 billion rubles ($11.6 billion) for the period. The previous five-year program up to 2000 was a total failure, and the next one, covering the years 2001-2005, received only 68 percent of its promised funding.[19] The planned increases will put the space budget into line with U.S. civilian space expenditures as a percentage of GDP. President Putin has stated that support for the space program is vital because it is "the locomotive that will pull forward all other industry spheres."[20] Generally, even though Russia's state-run space program may not be opening many new horizons beyond its major role in the *ISS*, Russian space companies have seemingly been able to retain their technological clout and are learning to operate in international markets. But, despite these achievements, Russia is still suffering from visible setbacks.[21] In 2005, for example, several Russian spacecraft (among them the Planetary Society's *Cosmos 1* solar sail, a Molniya-

3K military communications satellite, and the converted SS-N-23 Volna launcher, with a Lavochkin-designed “Demonstrator” D-2R cargo return device aboard) were lost in accidents.[22] In 2006, moreover, a Proton–M failed to place *Arabsat-4A* satellite into orbit.[23] This experience only additionally testifies to how vulnerable space missions are, even in the absence of hostile weapons-related activities, which Moscow seems nowadays to be anxious to avoid.

Russia as a Leading Proponent of Space Disarmament

Despite its past weapons programs, it would not be an overstatement to assert that Russia has traditionally been a major supporter of space security and arms control. As Russian Defense Minister Sergei Ivanov has declared, “Russia’s position on this issue has not changed for decades: We are categorically against militarizing outer space.”[24] Also, Russian President Putin’s keynote address to the U.N. General Assembly’s Millennium meeting in September 2000 castigated U.S. plans to “militarize space.”

From the beginning of space era, Moscow has staunchly supported practically all measures toward space security, given its own role in space and its appreciation for space’s effect on global stability. The USSR put forward a flurry of “peaceful” initiatives intended to show Russia’s commitment to space security goals, both for propaganda purposes and to protect the unsteady balance of so-called “strategic stability” by denying the United States any unilateral advantages that might tempt it to carry out a devastating nuclear first strike. From the onset of space arms control, Moscow has asserted that the placement of weapons in outer space, whether "offensive" or "defensive," would undermine the fragile process of nuclear disarmament and instigate a new arms race in an environment where halting or controlling such trends would be difficult. If left unattended, other countries might be urged to follow the suit of the superpowers, creating even greater instability and mistrust, thus diminishing overall security. This line of argumentation is still basically at the core of the Russian position on space security.[25]

Soviet plans for "general and complete disarmament" put forward between 1960 and 1962 included provisions for ensuring the peaceful use of outer space. The Partial Test Ban Treaty of 1963, co-sponsored by Moscow in the aftermath of the Cuban Missile Crisis, banned nuclear testing in space. The United States and the Soviet Union next started work on a future treaty dedicated specifically to space arms control, drawing on the unanimous U.N. General Assembly declaration of space legal principles from 1963. The Soviet Union, however, in line with its "linkage" approach to space, initially would not separate these talks from other disarmament issues, nor would it agree to restrict outer space to peaceful uses unless U.S. foreign bases housing short- and medium-range nuclear-tipped missiles were also eliminated. Despite the draft space treaty's lack of verification provisions, it was estimated that even limited capabilities for space tracking would be adequate to detect launches and to follow objects in orbit. While the U.S. draft covered only celestial bodies, the Soviet draft encompassed the whole outer space environment. The United States finally accepted the Soviet position on the scope of the treaty, although not the proposed linkage.[26] Thus, Moscow became one of the sponsors of the groundbreaking Outer Space Treaty, which entered into force on October 10, 1967.

Soviet delegates were also quite active in the U.N. Conference on Disarmament (CD) in Geneva, supporting the resolution on Prevention of an Arms Race in Outer Space (PAROS) and advancing other peaceful proposals regarding space security. In 1986, then-Soviet Premier Nikolai Ryzhkov in a letter to the U.N. secretary-general suggested the creation of a World Space Organization that would monitor the exchange of "peaceful" space technology.[27]

After 1981, the USSR proposed a draft treaty on the "Prohibition of the Stationing of Weapons of Any Kind in Outer Space,"[28] a "Treaty on the Prohibition of the Use of Force in Outer Space and from Space against Earth,[29] and a U.N. General Assembly resolution on the use of space exclusively for peaceful purposes,[30] as well as several other drafts on its non-weaponization. Soviet officials and scientists considered the then-existing legal basis for space security (the Outer Space Treaty and the ABM Treaty) sufficient but too limited. Thus, they wanted to introduce bans on other kinds of potential space weapons in order to block potential U.S. deployment of ASAT or ABM weapon systems in space.[31] These prohibitions, from this perspective, were intended to apply to all kinds of weaponry in order to prevent the United States from using lasers, directed-energy weapons, kinetic energy weapons, and other potential technologies.

Following the end of the 1980s' feud over the U.S. Strategic Defense Initiative, the politicization ensuing from the U.S.-Russian battle in the late 1990s and early Bush administration (2001-02) around the fate of the ABM Treaty killed many potential initiatives on space security. The negative U.S. attitude towards participation in the Russian-sponsored conference "Space without Weapons: an Arena for Peaceful Cooperation in the 21st Century," held in Moscow in April 2001 as part of President Putin's celebration of the 40th anniversary of the first man in space, served as an example of this great divide. The goal of this conference was to develop peaceful cooperation in the field of space research and to search for new ways of broadening its international context. The U.S. decided not to send a delegation, and appealed to other states to follow suit. Spokesmen for the Bush administration explained the refusal to attend the forum by claiming it was part of the Russian campaign to discredit the American national missile defense program.

Currently, the U.N. PAROS resolution, which is annually re-confirmed by the U.N. General Assembly, calls upon states to reinforce mutual trust and cooperative security. It highlights the fact that the current legal regime in itself does not actually guarantee the prevention of an arms race. Therefore, this legal regime, in the view of the Russian Federation, needs to be strengthened and made "comprehensive" in order to increase its effectiveness. Indeed, the only weapons the Outer Space Treaty bans from being stationed in space are nuclear and other weapons of mass destruction and weapons on the Moon, since these were the primary concerns at the time of its adoption. Therefore, the Russian argument goes, a ban must be introduced on the development, production, testing, and placement of all weaponry in outer space or intended to be used against space objects, regardless of whether these weapons are ground- or space-based. The view is that a set of rules to enforce peaceful and non-weaponized, non-aggressive uses of space must be introduced.

In his speech to the General Assembly of the United Nations in September 2001 former Russian Foreign Minister Igor Ivanov invited the world community to start working out a comprehensive agreement on the non-deployment of weapons in outer space and on the non-use or threat of force against space objects. He stated that the agreement should contain the following elements[32]:

- outer space should be used in conformity with international law and in the interests of "maintaining peace and security";
- states should adopt an obligation not to place into Earth orbit any objects carrying any kind of weapon and not to station such

weapons on celestial bodies or in outer space in any other manner;

- states should refrain from use or threats of use of force against space objects; and
- as a practical first step, a moratorium should be declared on the deployment of weapons in outer space pending a completed international agreement.

The Russia Federation stated its immediate readiness to adopt such a moratorium, provided that the other leading space powers join in.

Russians and Chinese diplomats have been relentlessly pushing analogous initiatives in United Nations. Their diplomatic struggle, however, has so far been in vain, as the United States continues to block the establishment of arms control bodies (i.e., within the CD), and also refuses to limit itself in issues of national security, thereby rejecting further restrictions on its future space operations.

The Russian initiatives announced in 2001 were later embodied in the Russo-Chinese working paper on possible elements for a future international legal agreement on the prevention of the deployment of weapons in outer space. Russia, China, and several co-sponsors submitted a document called "Possible Elements of a Future International Legal Instrument on the Prevention of the Weaponization of Outer Space" to the CD at its June 28, 2002, meeting. This proposal suggested three basic obligations[33]:

- "Not to place in orbit around the Earth any objects carrying any kinds of weapons, not to install such weapons on celestial bodies, and not to station such weapons in outer space in any other manner";

- "Not to resort to the threat or use of force against outer space objects"; and
- "Not to assist or encourage other states, groups of states, international organizations to participate in activities prohibited by this Treaty."

To enhance mutual trust, the proposal called upon states to declare the locations and activities of their space launch sites, the purpose of objects being launched into outer space, and the orbital locations of their spacecraft. In 2002, Russia pledged its readiness to provide information on its planned space launches by putting this information in advance on the Russian Foreign Ministry website as a confidence-building measure with the aim of stimulating substantive discussions at the CD on the issue of PAROS.

Despite U.S. opposition, Russia is slowly working on establishing the "building blocks" for an eventual space non-weaponization treaty. In August 2004, Russia and China circulated detailed materials on verification issues for a future agreement. In October 2004, Russia stated at the 59th U.N. General Assembly session that it would not be the first to station offensive weapons in space, while also calling on all other space powers to follow its example.

On June 9, 2005, Russia and China released another working paper, demanding once again that the U.N. CD start discussions on a possible treaty that would prevent the weaponization of space. On

February 16, 2006, Russia and China presented to the CD a second revised compilation of comments and suggestions on PAROS. The purpose of the compilation was to facilitate in-depth discussions and to single out "clusters of issues" on which states had similar or identical approaches.

In October 2005, the First Committee of the U.N. General Assembly overwhelmingly, by 158 votes to one—with the United States opposed and Israel abstaining—adopted a Russian-sponsored resolution on transparency and confidence-building measures in space.

Russia and U.S. Space-based Defenses

The Russian political and military community is currently obsessed with the fear that the United States will finally proceed with massive weapons deployments in space, which Moscow would likely be unable to counter.[34] Experts suggest that any state that militarily dominates outer space might try to control international communications and access to land, sea and air theaters of war. They have no doubts that the United States is presently bent on ensuring its exclusive control of space as one of the most important attributes of its cherished status as the lone global superpower.

Russian military officials are worried that Washington could eventually obtain the capability to launch a surprise attack in which space would be used both for striking Russian targets and blinding its command, control, communications, and reconnaissance networks.[35] Retired Ministry of

Defense officials, military officers, and representatives of the former Soviet military-industrial complex speak of dire strategic consequences for Russian security if U.S. nation-wide missile defenses are fully deployed and predict a new frenzied arms race with general destabilization of the global strategic environment. They do not discount the possibility of a disarming "bolt-from-the-blue" U.S. strike from space as Washington seeks undisputed, unilateral military advantages. Indeed, any type of space-based weapons could, in the Russian view, have disastrous consequences for strategic stability, particularly as they affect the strategic forces and information systems of other side.

Even though the U.S. is no longer officially viewed as a military archrival or, at least, a major strategic threat, Russia critics see U.S. space policy as an organic element of U.S. strategic efforts that have traditionally been alarming to Russia. Therefore, Russians are watching U.S. military space programs very carefully and sometimes overreact in their efforts to thwart any potentially hostile developments in the strategic domain.[36] They sincerely believe the overly enthusiastic, space-superiority incantations that are floated by U.S. Air Force generals, not grasping the way the U.S. government functions or paying attention to the fact that funding for many of these bold plans is seldom being provided by Congress. For this reason, some Russian experts in both the non-governmental and governmental communities fall for the rhetoric of professional U.S. spacewarmongers and industry lobbyists by overreacting to media-fanned stories on U.S. plans to launch "Rods from God" bombardment systems or other Hollywood-styled, space-based kill systems.

These views were only strengthened following the release of the Pentagon's "National Defense Strategy" in March 2005, which included the goal of assuring U.S. access to outer space and not allowing its use by adversaries.[37] Many Russian experts believe that U.S. activities in military use of space are currently limited only by technological—not political—constraints.[38]

The former Commander of Russia's Military Space Forces and current head of Roskosmos agency Colonel-General (retired) Anatoliy Perminov said in 2001 that the international community:

> …should be on guard regarding the U.S. policy of the military utilization of outer space. The military-political leadership of the United States continues to nurture plans to …create a missile-defense system using space-based elements and to launch a chemical laser into space.[39]

He also mentioned that the U.S. military doctrine of "reserving the right to employ forces to conduct military operations in space, through space and from space" is a source of great Russian concern. Perminov acknowledged the probability of the weaponization of space in the 21st century, but stressed that such deployment would inexorably lead to a new arms race. Perminov, however, denied that the establishment of the Russian Space Forces in 2001 signaled any intent by the Russian military to follow U.S. space weapons aspirations, stating: "Russia has never had and does not have any plans to create and place in orbit any space systems with weapons on board."[40] At the same time, however, some experts in Russia have argued that the much-touted "revolution in military affairs" stimulated by space and precision-strike capabilities requires Moscow to re-consider its options in space. They say that Russia needs anti-ASAT technology and smaller, better-protected satellites to reduce its vulnerability, as well as possible first-strike capabilities in space. U.S. military space plans only stimulate Kremlin efforts to preserve Russian military space capabilities.

Although the Russian government toyed in the 1990s with the idea of following the U.S. suit into development of a certain limited ABM (even space-based) components, it later decided to stick with the traditional stance based on mutually assured destruction and the ABM Treaty, adopting arms control postures consistent with the vast majority of states in Europe and elsewhere.

In fact, the initial implementation of the U.S. national missile defense program has alarmed many countries. The security and well-being of many nations, not just the United States, depend on their ability to operate in outer space, well beyond the limits initially expected some 30-plus years ago when the first agreements on space began to materialize.[41] Russia largely rejects U.S. references to a possible "space Pearl Harbor," terrorist threats in space, and the risk of possible rogue state actions in orbit. For the time being, the Russian view is that there is no threat to U.S. military assets to justify wide-ranging space weapons; therefore, Moscow views actual U.S. intentions in space with suspicion. Russia (like China) is likely to respond to any U.S. space weapons with inexpensive space weapons and a cessation of cooperative nonproliferation programs.

In June 2005, Russian Defense Minister Ivanov, speaking at the Baikonur launch site in Kazakhstan, stated that Moscow was ready to confront the weaponization of space. As Ivanov explained: "If some state begins to realize such plans, then we will doubtless take adequate retaliatory measures."[42] Before this speech, Russia had expressed only the intention to use space for non-weapons-related missions. Thus, the Russian government, while focusing on diplomatic avenues to resolve the problem, has not discarded applying more powerful tools.

As a general response, Russia is brandishing its newly developed strategic weapons systems, such as the high-speed, maneuverable re-entry vehicle (MARV) for the modified Topol-M ICBM and new (Topol-based) Bulava-30 sea-launched ballistic missile, which are also touted as weapons capable of piercing any eventual American ABM defense.[43] President Putin, alarmed at the post-Soviet decline in Russian military space capability, is sending strong domestic and international signals focused on reinvigorating Russian space control capabilities.

This new spiral of adversarial U.S.-Russian verbal altercation is worrisome, as it is occurring against the backdrop of the inability of the two leading global nuclear powers to back off from their Cold War geopolitical standoff. It now looks like the euphoria of the aftermath of the demise of the Soviet Union was unfounded and that the two states still view each other as major strategic opponents. Not much has actually changed in the two sides' strategic nuclear postures, even if the numbers have been reduced.

Moreover, the notion that the United States and Russia are no longer visceral ideological enemies it is not shared by the new Russian elite under Putin. Remaining pro-Western sentiment is being counterbalanced by fears and resentment about the selfishness, if not anti-Russian nature, of U.S. foreign policy. The Russian military, for example, doubts the U.S. claim that its current missile defense configuration (with an imminent space-based component) does not threaten Russia's nuclear retaliatory capabilities.

Russia's stance, however, is not free from contradictions. In typical Soviet manner, Russia's stance on the weaponization of space represents a peculiar mixture of bluster and desperation. Defense Minister Ivanov has deemed the U.S. missile defense program as almost "a myth," easily penetrable by Russian missiles, especially if their potential is only slightly upgraded. But no "asymmetrical responses" to missile defense—

except the MARV warhead system and Russia's extension of the life cycle of its existing multi-warhead ICBMs—have so far materialized. On the other hand, new strategic weapon modernization is once again being pushed, the military budget is being boosted dramatically, and the defense R&D structure is being revitalized. This could lead to new attention paid to the space-based combat components in the future. (The Russian military is reportedly researching possible development of a new ASAT with an airborne laser on board an A-60 aircraft.)

Conclusion and Possible Outcomes

Russia's response to U.S. military space policies has been mixed. Moscow has taken a range of diplomatic steps, such as pushing forward an inventory of U.N.-backed resolutions. It has also declared its intention to proceed with some limited ABM developments of its own (resembling Yeltsin-era plans for a limited ABM system), undertaken some strategic nuclear modernization, and begun planning for possible future space defenses (if they become necessary). Russians, in their typical Slavic fatalism, believe that the United States will be spurred to deploy space weapons by its perceived need for defenses to protect the U.S. space-based "eyes" and "ears" (the information-reconnaissance infrastructure) of its missile defense program.[44] But they also believe that such moves could make inevitable the introduction by other states of countermeasure technology, as always emerges in the offense-defense competitive cycle.

Unfortunately, by introducing allegedly valuable "defensive" technologies, the space-faring states could gradually lose control over their own achievements.[45]

These points raise a question: why don't Russian authorities pressure the U.S. administration and address the world public, arms control community, and receptive Europeans who are fearful of American schemes of total space dominance? The time for meaningful discussions of the necessity of a new arrangement for prohibiting space weapons—with the participation of practical experts, academics, and the general public—has definitely arrived, now that space weapons might soon appear as the natural continuation of further U.S.-led efforts in weapons innovation.

Russian experts have raised a number of possible solutions in the hopes of steering future space developments in a positive direction. For example, since the U.S. military posture depends more that of any other country on the successful functioning of space-based support systems, some Russian experts (such as former Duma member Alexei Arbatov) believe that it is still possible to convince Washington that it would be better to ensure spacecraft safety (via new accords and international legal restrictions) rather than to deploy ASAT weapons to "protect" these systems. There is no doubt that this issue requires further research and study of the comprehensive space security architecture necessary to ensure the peaceful use of space. For instance, is there a need to differentiate between the deployment of arms during peacetime and during times of crisis? Will such differentiation have a legal basis? Is it legal to develop space weaponry with nuclear warheads to prevent a possible collision of asteroids with Earth? Should weaponry used in such a fashion still be considered as a military use? According to Russian experts, it is very important that a scrupulously developed methodology be employed to these problems.[46] Most likely, Russian policy will need to become more inventive and more insistent if its aims are to be achieved.

Some recently floated ideas might become a workable prelude to larger transparency and confidence-building commitments. One such proposal is the conclusion of a bilateral U.S.-Russian agreement (potentially extendable to a multilateral treaty) on the "immunity" of commercial space assets from attack—a sort of civilian, non-aggression pact applied to non-military spacecraft on the both sides, as an extension of existing U.S.-Russian treaty protections for "national technical means" of verification.[47] The treaty could also encompass non-interference with communications, navigation satellites, weather satellites, GPS satellites and others space assets such as telecommunication and weather satellites.[48] In order to protect these assets, it may become necessary for states to claim zones around these space assets as national territory in order to protect them, even though such a measure would clearly contradict the *res communis* doctrine of the Outer Space Treaty. In the context of missile defense, if and when it is effectuated, space could be used exclusively for sensors and guidance equipment, but not for the stationing of destructive systems.

In the meantime, several initial steps should be intensively examined. First, Washington could initiate discussions with Moscow and, possibly, Beijing and the EU, on confidence-building measures for space. This might eventually lead to a "code of conduct" that could include provisions against simulated attacks, the flight-testing and deployment of space weapons, and dangerous maneuvers in space. Second, a multilateral treaty on the immunity of civilian satellites (mentioned above) could be worked out. Third, Russia and the United States could resume their bilateral discussions of 1978-1979 on prohibiting ASAT weapons and then lead a multilateral treaty process. These prohibitions might eventually be extended to other potential space weapons systems (including lasers). And, fourth, an International Space Monitoring Agency (as previously suggested by France)[49] could be created where the leading space powers lend their radars and satellite capabilities for the purpose of improved stability.

Unfortunately, U.S. policy remains a major obstacle. The Bush administration's logic—similar to that of the Clinton administration—runs that all further curbs will affect mainly the flexibility of the U.S. use of space for military purposes. There is an evident belief in Washington in the preponderance and perpetuity of America's unrivaled technological lead in space technology. However, the United States and its closest allies, despite their frantic technological efforts and robust funding, could lose this contest in the future. Such negative trends could be accelerated by China's aggressive efforts in acquiring a major space presence, Russia's possible economic and general military-technological revival, or the sudden surge of "rogue" states in procuring indigenous space technologies, such as demonstrated recently by Iran's interest in space. Despite the obvious reluctance in Washington to debate any meaningful space-related arms control or even military confidence-building proposals, experts should continue mulling over the potential pragmatic ways and topics for starting such a process in the future. It is important that, by the time the opportunity occurs—perhaps after 2008—a "critical mass" of realistic ideas and assessments already be accumulated for future negotiators. These might include the ideas mentioned above or new ones developed by scholars, analysts, and former officials.

The threat of space's weaponization is growing and could eventually turn into a self-fulfilling prophecy. In the meantime, states need to take calculated and balanced steps to create a legal basis for prudently removing the possibility of such an eventuality before it is too late.

Notes

[1] See I. K. Golovanov, *Sergei Korolev: The Apprenticeship of a Space Pioneer* (Moscow: MIR Publishers, 1975).
[2] See Nicholas L. Johnson, *Soviet Military Strategy in Space* (London: Jane's Publishing Company, 1987); also James Oberg, *Red Star in Orbit* (New York: Random House, 1981).
[3] Pavel Podvig, "Russia and Military Uses of Space," working paper prepared for the American Academy of Arts and Sciences Project "Reconsidering the Rules of Space," June 2004.
[4] Aelita Baichurina, Vladimir Kucherenko, Boris Talov, "Satellite Exterminators against Star Wars" (in Russian), *Rossiyskaya Gazeta*, March 3, 2000.
[5] See the Astronautix website <http://www.astronautix.com/craft/isa.htm> and the GlobalSecurity.org website <http://www.globalsecurity.org/space/world/russia/mini.htm#ref126>.
[6] See "A Visit to Sary Shagan and Kyshtym," *Science & Global Security*, Vol. 1, Nos. 1-2, 1989, p. 165.
[7] On the Almaz, see the Astronautix website at: <http://www.astronautix.com/craft/almzops2.htm>.
[8] See Maxim Tarasenko, *Military Aspects of Soviet Cosmonautics* (in Russian) (Moscow: ARP, TOO "Nicole," 1992); A. Pavlov, "How the War in Space was Prepared" (in Russian), *Komsomolskaya Pravda*, October 25, 1997; Ivan Safronov, "Star Wars: Finger from the Sky" (in Russian), *Kommersant-Vlast*, September 19, 2000; and James Oberg, "U.S. Vulnerability in Space Deserves Attention Now," *USA Today*, May 17, 2001.
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[10] See V.S. Arunachalam, "Desire and Denial: The Nullification of Cryogenic Rocket Motor Technologies to India," available on the Eisenhower Institute's website at: <http://www.eisenhowerinstitute.org/programs/globalpartnerships/fos/newfrontier/arunarticle.htm>; see also "GSLV," on the Federation of American Scientists' Space Policy Project website at: <http://www.fas.org/spp/guide/india/launch/gslv.htm>; and "Russia Transfers Advanced Technology to India Despite U.S. Pressure," Executive News Service, March 15, 1994.

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[15] "Russia and America in space: together or apart? The *ISS* experience does not answer this question unequivocally" (in Russian), *Izvestiya*, April 8, 2005.
[16] Yuri Politov, "Russian-French Ural has learned to fly" (in Russian), *Izvestiya*, February 16, 2006.
[17] Sergey Leskov, Anatoly Perminov: "Russia is champion in space launches" (in Russian), *Izvestiya*, December 29, 2005, available at: <http://www.izvestia.ru/science/article3046609>.
[18] Anatoly Perminov, "Russia has a spacecraft for Lunar and Martian missions" (in Russian), *Izvestiya*, March 25, 2005.
[19] Alexander Boyarchuk, "Space Science is being chased out of the market. The future of Russian space research is in danger" (in Russian), *Nezavisimoye Voennoye Obozreniye*, March 25, 2005.
[20] Jim Heintz, "Russians mark 40th anniversary of cosmonaut's flight. Putin promises to revive flagging space program," Associated Press, April 13, 2001, at: <http://web.caller.com/2001/april/13/today/national/23093.html>.
[21] Viktor Myasnikov, "Space leadership is to be ceded" (in Russian), *Nezavisimoye Voennoye Obozreniye*, September 9, 2005.
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[23] "Another failure of the Briz-M booster: Arabsat was not put into planned orbit" (in Russian), *Izvestiya*, March 1, 2006.
[24] "Russia against space militarization," <www.chinaview.cn>, June 2, 2005.
[25] Alexander Yakovenko (Russian Foreign Ministry spokesman), "Why it is dangerous to place weapons in

space" (in Russian), *Rossiyskaya gazeta*, May 2, 2005.
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[27] Alexander Piradov, "Creating a World Space Organization," *Space Policy* (May 1988), pp. 112-114.
[28] U.N. General Assembly Document A/36/192, August 20, 1981; and CD Document "Letter Dated 6 April 1982 from the Representative of the Union of Soviet Socialist Republics Addressed to the Chairman of the Committee on Disarmament Transmitting the Draft Treaty on the Prohibition of Stationing of Weapons of Any Kind in Outer Space Submitted to the Thirty-Sixth Session of the General Assembly," CD/274, April 7, 1982.
[29] UN General Assembly Document A/38/194, August 26, 1983; and "Letter Dated 19 August 1983 from the first Vice-Chairman of the Council of Ministers of the Soviet Socialist Republics, Transmitting the text of a Draft treaty on the Prohibition of the Use of Forces in Outer Space and From Space Against the Earth," CD/476, March 20, 1984.
[30] U.N. General Assembly Document A/39/243 of September 27, 1984.
[31] E. Velikhov , R. Sagdeev, and A. Kokoshin, eds., *Space Weapons: Security Dilemmas* (Moscow: Mir Publishing House, 1986), pp. 160-162.
[32] See highlights of the English-language version of the speech posted on the Eisenhower Institute's website at: <http://www.eisenhowerinstitute.org/programs/globalpartnerships/fos/newfrontier/Ivanov1.htm>.
[33] See "Russia-China CD Working Paper on New Space Treaty, June 27, Russian Statement," on the website of the Acronym Institute, June 2002, available at: <http://www.acronym.org.uk/docs/0206/doc10.htm>.
[34] "Russia's Putin Calls for Ban on Weapons in Space,"

Space.com, available at: <http://www.space.com/news/spaceagencies/putin_space_000906_wg.html>.

[35] "Pentagon's 'Hawks' are Rushing into Outer Space" (in Russian), *Izvestiya*, June 3, 2005.

[36] Russian Foreign Ministry spokesman Alexander Yakovenko wrote in the May 25, 2005, edition of *Rossiyskaya Gazeta* that: "Moscow was particularly worried about reports of U.S. plans to deploy strategic weapons in outer space, in particular to deploy missile defense components in circum-terrestrial orbit." He continued, "as a practical step ensuring the prevention of the deployment of any type of weapons in space, Russia plans to propose a draft resolution of the U.N. General Assembly on measures to ensure transparency and confidence building in space activity." Yakovenko also stated that space "is our common patrimony and its exploration and use only for peaceful purposes would serve the interests of the international community."

[37] U.S. Department of Defense, "The National Defense Strategy of the United States of America," March 2005, p. 9.

[38] James Oberg, "Fear and loathing in orbit. Space robot's failure adds to confusion over weapons," MSNBC, posted on April 29, 2005, at: <http://www.msnbc.msn.com/id/7671805/>.

[39] "General Perminov does not exclude the stationing of weapons in outer space" (in Russian), Interfax News Agency, May 30, 2001.

[40] Ibid.

[41] Philip E. Coyle and John B. Rhinelander, "Drawing the Line: the Path to Controlling Weapons in Space" *Disarmament Diplomacy*, Issue No. 66, September 2002, available at: <http://www.acronym.org.uk/textonly/dd/dd66/66op1.ht

m>.

[42] Ivanov quoted by UPI, June 20, 2005.

[43] Julia Petrovskaya, Natalya Melikova, and Alexander Babkin, "The Diplomacy of Nuclear Incontinence" (in Russian), *Nezavisimaya Gazeta*, November 18, 2004.

[44] Andrei Kislyakov, "Washington Ready to Deploy Orbital Missile Interceptors," RIA Novosti , April 26, 2005.

[45] Sergei Ivanov, Minister of Defense of the Russian Federation, "Russia will develop its own ABM system on the principle of common sense, technological possibilities and the situation of the economy" (in Russian), *Vedomosti*, January 16, 2003, p. A2.

[46] See, for example, Stanislav Rodionov, *Technical Problems in the Verification of a Ban on Space Weapons* (New York: United Nations, 1993).

[47] Vladimir Kozin, "A first step toward the non-militarization of space" (in Russian), *Nezavisimaya Gazeta*, November 11, 2000. This concept is based on prior ideas suggested in Paul B. Stares, *The Militarization of Space: US Policy, 1945-1984* (Ithaca, NY: Cornell University Press, 1985) and Paul B. Stares, *Space and National Security* (Washington, DC: The Brookings Institution, 1987).

[48] See Jonathan Dean, "The Current Legal Regime Governing the Use of Outer Space," paper delivered to the Outer Space and Global Security Conference, Geneva, Switzerland, March 25-26, 2004.

[49] France put forward this idea in 1978 in a proposal made at the CD. It was later developed at the CD in the late 1980s. See U.N. document A/S-10/AC.1/7.

Next Steps Toward Space Security

James Clay Moltz

Although the concept of "space security" has been the focus of increasing discussion in recent years, there seems to be little agreement on what it actually means. Most definitions focus generally on *freedom of access to and activity in space*, but the means through which these benefits are to be achieved differ dramatically. The reason is that authors adopt various underlying assumptions about the nature of the international system (anarchic or "managed"), the main aim of states (dominance or prosperity), the most effective currency of power (hard or soft), and the role of technology (independent or socially moderated). Not surprisingly, there is considerable debate on these topics, since bigger questions about human nature, international politics, and economic development are involved.[1]

Traditionally, however, almost all discussions of space security have focused on states. The reason is that two countries (the Soviet Union/Russia and the United States) have dominated space activity since 1957. However, this is beginning to change, as Russia has declined from its prior space position (particularly in the military area)[2] and other countries (China, India, Japan) and international organizations (the European Space Agency) have emerged as major players. Although not as readily noticed, other new actors are also beginning to affect questions of space security:

multilateral consortia, non-governmental organizations, universities, and small private firms. These actors do not fit neatly into existing formulas for space security, which assume the dominance of state actors. Indeed, the revolutionary changes going on within space today may presage a "paradigm shift" in space security discussions, one in which companies and other non-state actors could emerge as the dominant players, eclipsing the current role of states and national space programs.

The purpose of this paper is, first, to try to set a baseline understanding of the history of space security and how states have pursued it (individually or collectively) in the past. It identifies three general periods of space security relations: 1) the Cold War, from 1957-91; 2) 1991 to the present; and 3) a new phase that will begin in approximately 10 years, when a variety of new, non-state actors—particularly in the commercial sector—begin to emerge as major players and complicate traditional patterns of great power dominance in space. As part of tracing these dynamics, the paper comments on the evolution of factors affecting space security. The argument presented here is that, despite current trends toward weaponization, commercial and non-military actors are likely to increase in importance over the next several decades, impinging upon state efforts to define space in traditional ways. Instead, these transnational trends will put pressure on states collectively to "manage" their military activities and refrain from damaging key zones of space (such as low-Earth orbit), where new commercial applications will be expanding and generating significant profits. As discussed in the paper's conclusion, the historical analogy of early challenges in expanding the use of railroads may help inform current directions in space security.

Stages in Space Security

A general assumption of most analysts looking back on the Cold War in space is that space security relations were characterized by two implacably hostile adversaries seeking continual advantage over the other at whatever cost. However, closer analysis reveals that there are actually two distinct periods within this larger space of time: 1957-62 and 1963-91. The dynamics of each period differed substantially.

From 1957-62, the United States and the Soviet Union extended their existing policies on Earth to space, attempting to achieve space security through unrestricted military means. Given the mutual mistrust that dominated the 1940s and 1950s, there seemed to be no alternative. The period witnessed 11 attempted U.S. and Soviet nuclear weapons tests in space and many others at high altitude, as both sides attempted to establish anti-ballistic missile (ABM) and anti-satellite (ASAT) weapons capabilities. Both sides engaged in extensive planning for offensive military operations in and from space, including orbital space planes, space mines, orbital nuclear weapons, and a host of other even more fanciful concepts. However, the results of this competition soon began to have harmful effects on critical space missions, such as military photoreconnaissance and commercial communications. Fearing the possible loss of these assets (particularly from electro-magnetic pulse radiation), the two sides began to back away from a variety of dangerous military acts. Their acceptance of mutual military restraint ushered out a period of military-led space security approaches and ushered in a period of negotiated space security.

Beginning in 1963 with the Limited Test Ban Treaty, the two superpowers began to enact binding measures to keep conflicts in space from harming (and likely preventing) other critical uses, including, increasingly, human spaceflight. A 1963 U.N. resolution called upon states to renounce attempts to appropriate the Moon (or other celestial bodies), accept liability for their actions in space, and to notify other states in case of any experiments that might cause harmful interference with the space activities.[3]

Following subsequent negotiations led by the United States and the Soviet Union, these concepts and additional restrictive measures (including a prohibition of placing weapons of mass destruction in space) became codified in the 1967 Outer Space Treaty. Bilateral limitations against space-based ballistic missile defenses (the 1972 ABM Treaty) and interference with satellite verification mechanisms (both the ABM Treaty and 1972 Strategic Arms Limitation Talks Interim Agreement) further restricted possible harmful acts in space through the route of diplomacy. Of course, across-the-board friendship did not automatically "break out" in space, given the ongoing superpower hostility. The Soviet Union tested a conventionally armed, co-orbital ASAT system in the late 1960s and 1970s and the United States tested an ASAT weapon and conducted a massive research effort known as the Strategic Defense Initiative (SDI) in the 1980s aimed at creating an umbrella-type defense against ballistic missiles. However, in their execution, none violated the central tenets of existing treaties[4] and none resulted in weapons being stationed in space. Despite the hostile rhetoric that dominated military space discussions, therefore, the two sides actually behaved in a remarkably restrained manner, given their plans in the 1950s and their capabilities to orbit a wide range of weapons systems by the 1980s. Instead, passive military systems—including elaborate and increasingly capable intelligence-gathering satellites, tracking radars, and early warning satellites—became the main tools used in the quest for space security during this second phase of the Cold War. While the negotiated consensus on military space restraint faced period challenges, the core agreements weathered the Cold War successfully.

With the demise of the Soviet Union in December 1991, the United States emerged as the unchallenged military leader in space. While it continued to abide by existing agreements, military planners, veterans of SDI, and some political leaders in Washington became increasingly frustrated with limitations placed upon U.S. military space activity by agreements signed with the nowdefunct Soviet government. Nevertheless, the Clinton administration in 1993 decided to continue to adhere to the ABM Treaty and continued to negotiate with Moscow to ensure that any changes in its interpretation would be consensual.

Following the 2000 elections and the eventual emergence of former Texas Governor George W. Bush as president, U.S. policy changed significantly. Basing its reasoning on the two Rumsfeld Commission reports (1998 and 2001) and their identification of U.S. vulnerabilities to both ballistic missile and anti-space attacks, the new administration withdrew from the ABM Treaty and began to pursue a military-led space security policy reminiscent of the late 1950s. Secretary of Defense Donald Rumsfeld attempted to push through funding for a study on the use of low-yield nuclear weapons in space for ballistic missile defense, but the Republican-dominated Senate rebuffed this challenge to the Limited Test Ban Treaty. Although the administration did not challenge the Outer Space Treaty, certain analysts advocating strategies of U.S. "space dominance" did advance such arguments.[5]

The Bush administration's policies have (with the exception of Israel) met with nearly universal condemnation internationally. Where other major space players (Russia, China, and the Europeans) are seeking to strengthen limitations on military activities in space—particularly destructive technologies—the United States has resolutely opposed such initiatives, both at the Geneva-based Conference on Disarmament (CD) and at the United

Nations in New York. Thus, the world currently lacks a consensus on how best to achieve space security.

Emerging Factors in Space Security

If we assume that the existing actors in space will continue to be states, the future seems one in which three options exist: 1) states will rally behind the United States and accept U.S. deployment of space defenses (and possibly offenses) with the aim of creating a new "coalition of the willing" to manage space threats through cooperative, although U.S.-led, military means; 2) states will convince the United States that its current route is unwise and bring it on board with new agreements to limit future space weapons; or 3) the system will be characterized by a division of space, which will likely create instability. However, this range of choices presupposes that trends in space activity will continue to be led by states. This assumption may well be faulty.

The main motivating factor driving technological development in space during the Cold War was political and military competition between the Washington and Moscow. As we move into the 21st century, a more likely driver of space technological developments is going to be the profit motives of private companies, which will benefit from continued drops in the cost of space access as new launch technologies come online. The opening of new markets for space products is likely to spur competition in the commercial sector and increase the range of users. Such developments will not only increase the number of providers but also increase both their wealth and political clout in major capitals, including with the U.S. Congress.

Such emerging trends can be seen in a number of areas of commercial space. The first is the space services, where satellite radio and more reliable, mobile telecommunications connections from low-Earth orbit (LEO) are experiencing increasing demand. While past communications providers tended to reside in geostationary orbit and customers put up with the additional time it took for signals to travel the additional 46,000 or so miles to that orbit and back, today's consumers are requiring higher quality and faster service, which means stronger signals and less "gap" time. This trend is increasing pressure on providers to offer services from LEO.

A second major thrust in the commercial sector is space tourism. To date, the record number of persons in orbit around Earth at one time is only 13.[6] This number will soon be surpassed, as providers such as Virgin Galactic begin to offer sub-orbital service and, later, private orbital space station visits.[7] Virgin Galactic plans to begin offering services as early as 2008. While this deadline may slip, the ability of private providers to launch and return ordinary (albeit initially wealthy) citizens to orbit on a routine basis within the next 10 years will begin to alter dramatically who "inhabits" space, removing that control from governments.

A related trend is the increasing internationalization of the space industry. During the Cold War, national companies produced spacecraft and launchers only for their own use and protected their technology fiercely. Today, a wide variety of launchers and spacecraft are available on the international market. In fact, one critical launcher being used for U.S. national security payloads—the Atlas V—now sports Russian engines, thus creating interdependencies that never existed before. This "globalization" of the space industry will make it harder and harder for states to follow their own courses, without consulting other countries and international companies regarding their actions. Such trends are likely to weaken nationalist tendencies seen during the Cold War and increase cooperation overall.

In terms of military activities, the pressure to put weapons into space—for both defense and for offensive-strike purposes—seems irresistible. Two leading defense analysts, for example, predict a future in which "the use of weapons in space becomes a customary matter."[8] Similar arguments about "technological determinism" dominate military journals and trade publications regarding space. Support for near-term deployment of even SDI-type systems—replete with full constellations of Brilliant Pebbles interceptors in LEO—can be found in major circulation newspapers.[9] However, the presence of increasing numbers of commercial and human payloads in LEO will make this increasingly difficult. The presence of inflatable space hotels where families will spend their vacations could make the obvious threats posed by the testing of weapons in LEO unacceptable to global society. More importantly, companies that will be making profits from such flights are likely to have increasing influence over national legislatures (including the U.S. Congress) that will have to vote on whether or not to authorize future weapons tests.

This combination of factors is likely to change the way the public and governments view space security. Instead of being dominated by national security concerns, “human security” concerns could come to play an even more influential role. Through this process, social and economic aspects of space exploration could become more important in the public mindset, particularly as space becomes more international.

Comparative National Perspectives

The Bush administration’s views on space security and the need for a military-led strategy do not necessarily represent a majority perspective in the U.S. political scene. But, in part to fend of charges of being weak on defense, the Clinton administration also resisted international efforts to create tighter restrictions on future space weapons. Unlike the Bush administration, however, it did not reject the concept of negotiated space security or state that it would pursue its interests unilaterally, as codified in the new U.S. National Space Policy.[10] The differences are seen in the Bush administration’s 2002 withdrawal from the ABM Treaty and its doubling of support for missile defenses and space weapons. What remains in question is the strength of Congressional support for such programs. While theater defenses and sea- and ground-based national missile defense components remain more or less unchallenged, backing for space weapons appears to be weak, based on recent cuts imposed by even the Republican-controlled Congress on a number of programs. Recent changes in the political complexion of the U.S. Congress and possibly after 2008 in the White House could affect funding for key programs significantly. Given likely delays in deployment decisions, the evolution of space commerce and the emergence of new actors may yet have time to make an impact on the space security debate.

As far as Europe is concerned, there has been strong support for efforts to strengthen space security through negotiated means. All European states are on record supporting the U.N. resolution on the Prevention of an Arms Race in Outer Space and none are known to have active space weapons programs (Russia is believed to have mothballed its past systems). Moreover, Europe is moving increasingly toward a "human security" focus in its defense policies, suggesting that the welfare of new spacefarers, the promotion of commerce, and remote sensing will remain the main points of focus. If we exclude Russian and British systems, France deployed the first European military reconnaissance satellite only in 1995 (with Helios).[11] Since that time, France has asserted the value of this passive military technology for increasing French independence from U.S. (and other) states, particularly in decisions affecting the use of its military forces.[12] Germany will soon follow suit, and there are plans for joint use of some military systems as well. However, no space weapons programs exist or are currently envisaged for space, except for possible Polish or Czech basing of U.S.-provided ground-based interceptors. But these technologies will not be under the control of the host.

In terms of space rivalries, few states in Europe see any significant military threats coming from this new environment. Instead, major European programs (such as Galileo) have welcomed participation by China, the country discussed most among U.S. analysts as the "threat" for which U.S. space weapons will be needed. Overall, the trend in European space activity is increasingly international and multilateral, rather than atomized and unilateral. Russia's decision to purchase a five percent stake in European aerospace giant EADS is but one recent indicator of this trend of the commingling of European space technology and finance. Thus, there is a significant difference between the U.S. and European approaches and considerable unity on the continent, particularly among the states most active in space.

In Asia, the map of space security is comparatively more fragmented. No region-wide cooperation exists in space and several national intelligence-gathering satellites have been launched in the past few years for the express purpose of spying on other Asian powers. For example, Japan has launched several so-called Information Gathering Satellites since 2003 and intends to expand their coverage, particularly as new Prime Minister Shinzo Abe seems eager to establish independent military capabilities for his country.

This new outlook includes a much more forward-leaning posture on ground- and sea-based missile defenses, although Japan currently has no plans for any space-based weapons and seems highly unlikely to move in that direction.

Notably, support for PAROS has been strong in Asia and all publicly available evidence points to a highly limited Chinese military capability in space and a main focus on expensive, civilian, manned programs. This suggests that the current military threat, as perceived in the United States, is at least somewhat overblown. Significant military capabilities will not be realized for at least a decade, if they are pursued consistently, which remains far from evident. Significant gaps will remain compared to U.S. systems, in any case. In these conditions, diplomacy and commerce may have a chance to assert themselves and overcome conflictual scenarios and nationalistic approaches to space security. However, it is important to note that nationalism remains an important motivation in Asia and national rivalries (China-India, South Korea-North Korea, and Japan-China/North Korea) could disrupt integrative trends. Moreover, outside events—such as further North Korean nuclear or missile tests—could disrupt efforts at regional security building and cause states to revert to Cold War alliances and arms races. Much will depend on the future of the U.S.-Chinese space relationship, as it is likely to set a dominant trend (either cooperative or competitive) that will reverberate throughout the region.

In considering U.S.-Chinese space scenarios, a critical factor is likely to be the establishment of trust and transparency.[13] If this hurdle can be overcome, perhaps through the establishment of cooperation in civilian space activities, chances are much better that military conflicts can be avoided. Today, China's clear emphasis on manned spaceflight increases the odds of success in this endeavor, if the United States decides to pursue it. The visit by NASA Chief Administrator Michael Griffin to Beijing in September 2006 was a first step in this direction. Results of this first meeting, however, proved disappointingly scanty. Thus, it will take follow-through and patience, as well as a willingness to resist the nay-saying of critics on both sides, to make such overtures to bear fruit.

Within the Pentagon, U.S. defense industry, and the U.S. Congress, there are influential players trying to block cooperation with China. Arguments are raised about China being the new Soviet Union. These voices call upon the Bush administration to deploy weapons into space before China does so. Recent Pentagon leaks, for example, suggest that China is intent on developing laser weapons and has already tried to interfere with U.S. intelligence satellites.[14] However, the actual evidence of such occurrences has thus far been limited, and the capabilities discussed are comparable to those of dozens of countries with laser technologies. While these claims cannot be dismissed, there is a tendency in the existing debate to rush to conclusions, making weapons developments (on both sides) inevitable. Such an outcome would benefit weapons manufacturers, but it would not provide much to promote space commerce or spin-off technologies for the world's economic benefit. Thus, states (including both China and the United States) need to be careful about the long-term implications of their actions.

In this context, a key question that will affect future space security is whether states will fall back on self-absorbed nationalist approaches—as has so frequently occurred in the past—or whether they will reach out and be willing to accept the inevitable transaction costs of collective security approaches. One possibility is that coalitions or even alliances might form in space. Unfortunately, for the United States, the current situation is one in which it risks isolation from major space powers that are cooperating extensively: China, Russia, and the Europeans. As Commander (U.S. Navy) John Klein argues: "Less capable space powers would be more inclined to limit and restrict the United States' ability to operation in outer space, if the intentions of the United States seem overly aggressive."[15] As noted above, longer-term thinking—and the careful investigation of possible alternative routes to space conflict—are called for before states engage in harmful behavior that is difficult to reverse.

Again, European views, as reflected in the essays included in this publication, seem to offer a broader definition of space security for the coming international debate. EU countries tend to see space more as a realm for developing cooperative economic opportunities and achieving military stability, rather than for pursuing unilateral benefits or military dominance. This approach should be promoted more assiduously and raised for consideration by the international community as an alternative to military-led approaches to security. However, achieving agreements that provide for collective benefits while ensuring verifiability against space weapons programs will not be easy or cheap. In this regard, European and Chinese efforts to develop space situational awareness networks may serve a positive purpose, although establishing a truly international network—perhaps with the aid of a new space-related international organization or a more modest multilateral network among providers—would strengthen the reliability of these data and improve transparency.

Conclusion and a Historical Reflection

The history of space security has witnessed considerable change in the accepted—or at least dominant—definition that has characterized space relations over time. Although the future outcome of this domestic and international debate remains uncertain, the issue is going to become increasingly important topic. The challenge internationally will be to form a new consensus among countries in the Americas, Asia, and Europe about a common definition for space security and mutually supported means for achieving it.

In some respects, the current state of space development mirrors the early period of the development of another revolutionary technology: the railroad. These parallels are worth a brief mention because they help put certain space trends into perspective. Rail travel created whole new vistas for the imaginations of persons previously bound to live their whole lives in regions limited to the distance they could travel in a day or two from their homes by horse or carriage. It also opened fundamentally new opportunities for national and, in some cases, international commerce, creating new markets and linking rural communities with distant cities and factories across vast stretches of countryside. However, as people began to travel to exploit this technology, the system proved unable to manage it. That is, the early expansion of routes in many regions boosted traffic beyond the capacity of primitive control systems, leading to frequent accidents and even deaths.[16] Space may be at analogous turning point.

Overcoming the railroad's administrative challenges required new and more sophisticated forms of management: accurate schedules, dual tracking, turnarounds, standardized time, signals, and enhanced communications. Space today shares certain characteristics with the railroads at this time. Human activities in space—and particularly LEO—are on the verge of a major expansion in commercial and tourist traffic, requiring *international* management to ensure safety and efficiency. Only if such cooperation among spacefaring states and companies is forthcoming will space be able to generate the kind of sustained and expanded commerce that many experts believe it is capable of. These conditions place a functional priority on enhanced international communication and broader definitions of space security than have been considered to date. They also mean the inclusion of new actors in the processes of decision-making.

In space, the emergence of new commercial actors, both large and small, and new multi-state consortia for space exploration, both manned and unmanned, could put important new stakeholders in positions of growing influence. These often-under appreciated trends may cause significant changes for space security because, in the end, commercial space will generate more profits and create greater demand for services than military space. It will also put more people into this new environment, raising risks of accidents and putting a new priority on human security. States and companies will be forced to cooperate if they are to ensure personal safety, traffic control, and debris mitigation. But new forms of collective space security are not inevitable. There are still powerful tendencies to fall back on state-centric, military-led policies in space. Yet states adhering to such narrow perspectives of security may run the risk of harming their international reputations, isolating themselves, and being left behind by more cooperative strategies, unless they can truly dominate other players. “Space control” policies, however, will require tremendous expense and offer no guarantee of success. Overall, broader definitions of security appear to be more appropriate to space, given its mixed activities, which already include a broad range of scientific, commercial, and passive military systems from many countries. In this sense, more sophisticated collective security approaches to space seem to be required. They have the benefit of support from powerful economic and social forces. But they will require significant time, commitment, and funding in order to be realized. Thus, there is considerable work ahead for all parties interested in managing the future of space security successfully.

Notes

[1] On the "hard power" side, see such works as Everett C. Dolman, *Astropolitik: Classical Geopolitics in the Space Age* (London: Frank Cass, 2002) and Steven Lambakis, *On the Edge of the Earth: The Future of American Space Power* (Lexington, KY: University Press of Kentucky, 2001). On the "soft power" side, see such studies as Theresa Hitchens, *Future Security in Space: Charting a Cooperative Course* (Washington, DC: Center for Defense Information, September 2004) and Michael Krepon (with Christopher Clary), *Space Assurance or Space Dominance? The Case against Weaponizing Space* (Washington, DC: The Henry L. Stimson Center, 2003). On the hard vs. soft power debate more generally, see See Joseph S. Nye, *Soft Power: The Means to Success in World Politics* (New York: Public Affairs, 2004).

[2] This decline may be in the process of being partially reversed, as the Russian government controls most revenues from oil and gas sales and the Federal Space Plan for 2006-2015 calls for reconstituting many of Russia's space assets.

[3] For the text of this resolution, "Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space" (First Committee Resolution 1962, approved December 13, 1963), see the United Nations website at: <http://daccessdds.un.org/doc/RESOLUTION/GEN/NR0/186/37/IMG/NR018637.pdf?OpenElement>.

[4] The possible exceptions worth noting are the Soviet Krasnoyarsk radar system and U.S. tests of component parts of a national missile defense system during the SDI period. However, both issues eventually fell by the wayside due to new political understandings between the two sides.

[5] See, for example, Dolman, *Astropolitik*, pp.140-141, and 177.
[6] Figure cited in “Mystery object delays shuttle landing,” CNN.com, September 19, 2006.
[7] See the Virgin Galactic Web site at: <http://www.virgingalactic.com/en/news.asp>.
[8] George and Meredith Friedman, *The Future of War: Power, Technology and American World Dominance in the Twenty-First Century* (New York: St. Martin’s Griffin, 1996), p. 375.
[9] See, for example, Henry F. Cooper and Robert L. Pfaltzgraff, “Lost in Space,” *The Wall Street Journal*, August 28, 2006, p. A12.
[10] See the official “U.S. National Space Policy” released in October 2006 on the Office of Technology Assessment’s website at: <http://www.ostp.gov/html/US%20National%20Space%20Policy.pdf>.
[11] Xavier Pasco, “Ready for take-off? European defence and space technology,” in Carl Bildt, Mike Dillon, *et al.*, *Europe in Space* (London: Centre for European Reform, October 2004), p. 22.
[12] *Ibid.*
[13] On this point, see Joan Johnson-Freese, “Scorpions in a Bottle: China and the U.S. in Space,” *The Nonproliferation Review*, Vol. 11, No. 2 (Summer 2004).
[14] See, for example, Vago Muradian, “China Tried to Blind U.S. Sats with Laser,” *Defense News*, September 25, 2006, p. 1.
[15] John J. Klein, *Space Warfare: Strategy, Principles and Policy* (New York: Routledge, 2006), p. 145.
[16] See Alfred D. Chandler, Jr., and Stephen Salsbury, “The Railroads: Innovators in Modern Business Administration,” in Bruce Mazlish, ed., *The Railroad*

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and the Space Program: An Exploration in Historical Analogy (Cambridge, MA: MIT Press, 1965), p. 132.