COLLECTIVE SECURITY IN SPACE

ASIAN PERSPECTIVES

John M. Logsdon
and James Clay Moltz

Editors

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THE GEORGE WASHINGTON UNIVERSITY
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ABOUT THE AUTHORS

SETSUKO AOKI

Dr. Aoki is a Professor of Policy Management at Keio University in Japan and was previously an Associate Professor at the School of Social Studies at the National Defense Academy of Japan, as well as an Assistant to the Faculty of Law, Rikkyo University. Professor Aoki obtained her B.C.L. from the Faculty of Law, Keio University, in 1983, her LL.M. from the Graduate School of Law, Keio University, in 1985, and her Doctor of Civil Law from the Institute of Air and Space Law, Faculty of Law, McGill University, in 1993. Professor Aoki is a member of the Japanese Association of International Law and the Japanese Association of World Law, and is a board member of the Air Law Institute of Japan and the Japan Association for International Security. Professor Aoki has published various articles on air and space law in Japanese and international journals and books.

DIPANKAR BANERJEE

Major General Banerjee retired from the Indian Army in 1996. His career included command of the 8th Mountain Division in the Kashmir Valley (1991-92) and the deputy directorship of the Ministry of Defence's Institute for Defence Studies and Analyses (1992-96). After retiring, General Banerjee founded the Institute for Peace and Conflict Studies in New Delhi, and served as its co-director through 1999. He was executive director and chief executive of the Regional Centre for Strategic Studies in Colombo, Sri Lanka (1999-2002). General Banerjee took part in the American Society of International Law's 1999-2001 Project on Accountability and the Use of Force, and was a senior visiting fellow at the Henry Stimson Center in 1997. He has been active in the Anti-Personnel Mine Ban Movement, addressing the organization's 1997 plenary session and preparing the South Asian Regional Survey for the 1999 Landmine Monitor Report. He has edited and co-edited several volumes on security topics including Kashmir, small arms proliferation, and regional confidence-building measures. He has also contributed articles and op-ed pieces to journals and newspapers in India and elsewhere. He is a graduate of India's National Defence Academy and holds master's degrees in political science (from Karnataka University) and defense studies (Madras University), in addition to having completed the National Defence College's graduate course.

BRETT BIDDINGTON

Mr. Biddington is the Space Initiative Manager–ASIAPAC in the Space Team of the Global Defense, Space and Security Group of Cisco Systems, Inc. He joined Cisco in November 2002 on completion of almost 23 years in the Royal Australian Air Force (RAAF). He retired as a Group Captain. His military career included serving as Commanding Officer of the Joint Telecommunications Unit Melbourne, senior intelligence officer in Air Force Headquarters, and the Provost Marshal and Director of Security for the RAAF, as well as work in capability development, where he sponsored a wide range of command and control, intelligence, surveillance, reconnaissance and electronic warfare projects. Mr. Biddington is now Chairman of the Australia Telescope Steering Committee, which provides high-level governance to radio astronomy in Australia. He is also Chairman of the Australian Defence Information and Electronics Systems Association (ADIESA) and the recently formed Australian Antarctic Astronomy Advisory Committee (AAAAC). He serves on several other boards and committees including the Advisory Board of the Institute of Telecommunications Research at the University of South Australia, the executive of the Australian Space Industry Chamber of Commerce (ASICC), and the board of the Australian Space Research Institute. Mr. Biddington graduated from LaTrobe University Melbourne in 1974 with a BA (Hons) degree, majoring in politics. He was a member of the Australian Diplomatic Service and a lecturer at the Canberra College of Advanced Education before joining the RAAF.

JOAN JOHNSON-FREESE

Dr. Johnson-Freese has served as Chair, Department of National Security Studies, at the Naval War College since August 2002. Previously, she was on the faculty at the Asia Pacific Center for Security Studies in Honolulu, Hawaii; at the Air War College in Montgomery, Alabama; and the Director of the Center for Space Policy and Law at the University of Central Florida. Dr. Johnson-Freese has testified before the U.S. Congress on several occasions regarding Chinese space activities and space security issues generally. She is on the editorial board of *China Security* and a member of the International Academy of Astronautics. Dr. Johnson-Freese's most recent book is entitled *Space as a Strategic Asset* (Columbia University Press, 2007). She has publicized prior books analyzing the space programs of China, Japan, Europe, and the United States, as well as over 80 journal articles relating to international space cooperation and competition issues.

CHANGDON KEE

Dr. Kee is a Professor in the School of Mechanical and Aerospace Engineering at Seoul National University, South Korea. Dr. Kee received his Bachelor's and Master's degrees in Aeronautics Engineering from Seoul National University and a Master's and Ph.D. in Aeronautics and Astronautics from Stanford University. Dr. Kee is an expert in satellite navigation systems, space mechanics, UAV automatic navigation and control, and avionics. He is currently an Asian Representative to the Satellite Division Executive Committee of the Institute of Navigation, an Editorial Board Member of the *Journal of Global Positioning Systems*, and an Advisor to the Ministry of Government Administration and Home Affairs and the Ministry of Construction and Transportation in Korea.

KYUNG-MIN KIM

Dr. Kim is a Professor in the Department of Political Science, Hanyang University, Seoul, South Korea. Dr. Kim received his B.A. in Political Science from Hanyang University in 1982 and received his M.A. (1985) and Ph.D. (1989) in Political Science from the University of Missouri. Dr. Kim was a research fellow at Tokai University, Rykkyo University, the Japanese Institute for Defense Studies, and the Friedrich Naumann Foundation, Germany. Dr Kim was also an exchange professor at Tokai University, the University of Missouri, and Waseda University. In Korea, Dr. Kim has served as an advisor for the Ministry of Foreign Affairs, the Board of Unification, the Ministry of Defense, the Agency of Central Personal Management, the Institute of International Education, and the Selection Committee of Astronauts. Dr. Kim is the author of numerous articles and books.

RAJEEV LOCHAN

Dr. Lochan graduated in Mechanical Engineering from BIT Sindri (Bihar), India, in 1973 and received his Master's in Aeronautical Engineering from IIT, Kanpur, India, in 1976. He acquired his Doctorate in Aerospace Engineering from IIT Kanpur in 1994. He joined the Vikram Sarabhai Space Center (VSSC), Thiruvananthapuram, in March 1997. He served as Counsellor (Space) at the Embassy of India in Washington, DC, from November 1997 to May 2001. Dr. Lochan's subsequent work at VSSC included involvement in research on diverse aspects of flight mechanics of launch vehicles. Together with his team, he was responsible for design, analysis, simulation, and analysis of ground test and post-flight analysis of all staging events of all the launch vehicle projects of ISRO.

In addition, he represented the Indian interests as alternate governor to INTELSAT. Before his death in an automobile accident in 2007, Dr. Lochan also served as Director, INSES (Information & Software Engineering Services), and Assistant Scientific Secretary, which including participation in formulation and implementation of various policies and programs within the Indian Space Research Organisation and management of all interfaces with outside agencies within the country and beyond including academia, parliament, Government, media, and international agencies. He has played key roles in many successful bilateral and multilateral negotiations.

JOHN M. LOGSDON

Dr. Logsdon is Director of the Space Policy Institute at George Washington University's Elliott School of International Affairs, where he is also Research Professor and Professor Emeritus of Political Science and of International Affairs. From 1983-2001, he was also Director of the School's Center for International Science and Technology Policy. He holds a B.S. in Physics from Xavier University (1960) and a Ph.D. in Political Science from New York University (1970). Dr. Logsdon is the author of *The Decision to Go to the Moon: Project Apollo and the National Interest* (1970) and is general editor of the eight-volume series *Exploring the Unknown: Selected Documents in the History of the U.S. Civil Space Program.* Dr. Logsdon is a member of the NASA Advisory Council and of the Commercial Space Transportation Advisory Committee of the Department of Transportation. In 2003, he served as a member of the Columbia Accident Investigation Board. He is a recipient of the Distinguished Public Service and Public Service Medals from NASA, the 2005 John F. Kennedy Astronautics Award from the American Astronautical Society, and the 2006 Barry M. Goldwater Space Educator Award from the American Institute of Aeronautics and Astronautics. He is a Fellow of the American Institute of Aeronautics and Astronautics and the American Association for the Advancement of Science, and a member of the International Academy of Astronautics and former Chair of its Commission on Space Policy, Law, and Economics. He is member of the Board of Directors of the Planetary Society and former chair of the Society's Advisory Council. Dr. Logsdon has also served as a member of numerous committees and commissions, including for the Japan's National Space Development Agency, the U.S. National Research Council, the Vice President's Space Policy Advisory Board, the Aeronautics and Space Engineering Board of the National Research Council, NASA's Space and Earth Sciences Advisory Committee, and the Research Advisory Committee of the National Air and Space Museum. He has twice been a Fellow at the Woodrow Wilson International Center for Scholars and was the first holder of the Chair in Space History of the National Air and Space Museum.

JAMES CLAY MOLTZ

Dr. Moltz is an Associate Professor in the Department of National Security Affairs at the Naval Postgraduate School. From 1993-2007, he held various positions at the Monterey Institute of International Studies' Center for Nonproliferation Studies, where he was Deputy Director from 2003-07. Dr. Moltz is the author of *The Politics of Space Security: Strategic Restraint and the Pursuit of National Interests* (Stanford University Press, forthcoming 2008). He is also co-written and co-edited several books on nuclear weapons proliferation, as well as dozens of articles and book chapters. From 1993-98, he was the Founding Editor of *The Nonproliferation Review*. Dr. Moltz holds a Ph.D. in Political Science from the University of California at Berkeley (1989), and M.A. and B.A. (with distinction) degrees from Stanford University. He worked previously as a staff member in the U.S. Congress and has served as a consultant to the U.S. Department of Energy and the NASA-Ames Research Center.

KIRAN K. NAIR

Wing Commander Nair is a serving office of the Indian Air Force. He has been attached to the Centre for Air Power Studies, New Delhi for a period of two years to undertake research on the "Role of Space in India's Defence." He is a prolific writer and his writings have appeared in numerous journals and periodicals ranging from the Airpower Journal to India's National Security Annual Review. In 2006, he authored a popular book, *Space: The Frontiers of Modern Defence*, which has now gone into its second edition. He was also instrumental in carrying out an independent study on space applications for the Indian Air Force. Academically, he has a BSc (honours) in Physics and an MBA in marketing.

MASASHI NISHIHARA

Dr. Nishihara is President of the Research Institute for Peace and Security. From 2001-06, he served as President of the National Defense Academy, Yokosuka. From 1977-99 he was Professor of International Relations at the Academy. During that period, he also served as Director of the First Research Department of the National Institute for Defense Studies, Tokyo, from 1993-95, and as Head of its School of Social

Sciences of the Academy from 1996-2000. After graduating from the Law Department of Kyoto University in 1962, he received his M.A. and Ph.D. in political science from the University of Michigan. Dr. Nishihara is a member of the Trilateral Commission, of The U.K.-Japan 21st Century Group, and of the Japan-Korea Forum. From 1986-95 he also served on the Council of the International Institute for Strategic Studies (IISS), London. From 2000-03, he was a member of Prime Minister Jun'ichiro Koizumi's Task Force on External Relations. From 2004-06, he also was a member of the Weapons of Mass Destruction Commission, chaired by Hans Blix of Sweden, which produced a report, entitled *Weapons of Terror; Freeing the World of Nuclear, Biological and Chemical Arms* (Stockholm, 2006). His publications include: *The Japanese and Sukarno's Indonesia* (1976), *East Asian Security and the Trilateral Countries* (1985), *Senryaku kenkyuu no shikaku* (An angle on strategic studies) (1988), *U.N. Peacekeeping: Japanese and American Perspectives* (co-editor, 1995), *Vietnam Joins the World* (co-editor, 1997), *Nichibei doomei Q&A 100* (The Japanese-U.S. Alliance: 100 questions and answers)(co-editor, 1998), and *The Japan-U.S. Alliance: New Challenges for 21st Century* (co-editor, 2000).

KAZUTO SUZUKI

Dr. Suzuki is an Associate Professor in the Graduate School of Humanities and Social Sciences, University of Tsukuba, Japan. He was previously an Assistant Professor in the College of International Studies of the University of Tsukuba and an Associated Researcher with the *Fondation pour la Recherche Strategique* in Paris. Dr. Suzuki serves as an advisor to the Japanese Aerospace Exploration Agency (JAXA) and the Society of Japanese Aerospace Companies (SJAC). Dr. Suzuki attended the Faculty of International Relations, Ritsumeikan University, in Kyoto, Japan and obtained his M.A. in International Politics from the Graduate School of International Relations, Ritsumeikan University, in 1995. Dr. Suzuki obtained his Ph.D. in Contemporary European Studies from the Sussex European Institute at the University of Sussex in 2000. Dr. Suzuki has authored numerous publications in Japanese and international journals.

YANG JUNHUA

Mr. Yang graduated from Harbin Institute of Technology with a B.S. degree in Machinery Manufacturing Technology and Automation. He has been engaged in aerospace management for more than 20 years. At present, he is the president and secretary general of the Chinese Society of Astronautics, and he actively promotes international academic exchanges and space science popularization.

ZHONG JING

Dr. Zhong is an Associate Professor at the National Defense University, China. Dr. Zhong received her B.S. in Weather Dynamics from the Science and Engineering University, People's Liberation Army (1992) and her M.A. and Ph.D. from the National Defense University (NDU). Dr. Zhong previously worked as an engineer at the Air Force Base at Dalian from 1992 to 1996, and she was a visiting scholar at The Center of Defense Strategy Studies of the Military College in Australia in 2003. Dr. Zhong specializes in military technology, international security and arms control from a technological perspective. She holds the rank of Lieutenant Colonel in the Chinese military.

INTRODUCTION

John M. Logsdon and James Clay Moltz[1]

An increasing number of countries are becoming involved in space activity, with disparate capabilities, goals, and both competitive and cooperative aims in regard to other space actors. For these reasons, and due to emerging pressures on space's finite resources (particularly in regions of space most useful for Earth observation, communications, and navigation), the future of space security—defined as the ability to access and use space free from threats of disruption—is being challenged. Unfortunately, the limited nature of existing international rules and treaties means that many questions remain unanswered. Either heightened military activity among states (perhaps with space weapons) or enhanced international cooperation is still possible. Given the ongoing stalemate in space arms control talks at the UN Conference on Disarmament in Geneva, the absence of an inter-governmental dialogue on space security means that there is an important role to be played by non-governmental organizations in stimulating international discussion, generating new ideas for policymakers, and distributing suggestions to governments, the media, analysts, and other interested parties. This volume is intended to serve these functions regarding Asian views of space security.

The debris-producing anti-satellite test conducted by China in January 2007 highlighted the importance of addressing conflicting national approaches to space security. In an effort to begin bridging these gaps, the George Washington University's Space Policy Institute (SPI), the Monterey Institute's Center for Nonproliferation Studies (CNS), and the Tokyo-based Research Institute for Peace and Security (RIPS) co-hosted a conference in Tokyo, Japan, on April 23-24, 2007, entitled "Collective Security in Space: Asian Perspectives on Acceptable Approaches." Generous support from the John D. and Catherine T. MacArthur Foundation and the Ploughshares Fund made this meeting and the current publication possible. The conference featured presentations by scientists,

[1] The editors thank Stephanie Bednarek for her assistance in preparing several of the papers in this volume for publication. They also thank Erik R. Quam for his contribution to an earlier conference report that this Introduction draws upon.

policymakers, and experts from China, India, Japan, Malaysia, South Korea and the United States. The 50 participants in the meeting discussed current Asian space capabilities, regional perspectives on space security, and possible regional and international initiatives to improve space security.

Overall, the conference showed that Asia currently lacks a regional consensus on space security, unlike the broad consensus and specific forms of cooperation that are emerging in Europe. Moreover, large differences in purpose, capabilities, and plans divide the various national space programs across Asia. However, there is regional support for new efforts to prevent the further weaponization of space and to craft new initiatives to enhance international cooperation. This volume offers comments, perspectives, and new ideas from a range of experts from throughout Asia. It aim is to familiarize U.S. experts and policymakers with Asian views and suggestions for addressing common security concern in space.

The collection opens with an essay by Dr. Masashi Nishihara (President, RIPS), who lays out the regional security context surrounding space activity in Asia. Dr. Nishihara surveys a range of challenges facing Asia today, including: the North Korean nuclear crisis, China's military modernization, political instability in Northeast Asia and in South Asia, and the economic competition taking place among Asian nations. While stating his belief that regional cooperation will continue to grow, Dr. Nishihara predicts that that the priority of national sovereignty is likely to remain a hindrance to Asian space security cooperation for the near future.

In his paper, Dr. Changdon Kee from Seoul National University analyzes South Korean space capabilities. He notes that South Korea currently has more than 10 satellites in orbit, but plans to expand to as many as 20 by 2015. Dr. Kee also discusses recent progress toward the completion of a domestic space launch facility being constructed on the southeastern tip of South Korea. He concludes with some observations about the problem of redundancy in national space-based navigation systems (such as the U.S. GPS system, the European Union's Galileo system, China's Beidou system, Russia's GLONASS, Japan's QZSS, and India's IRNSS) and outlines a plan for increasing collaboration and cost-savings through regional cooperation.

The next paper, by Yang Junhua, vice president and secretary general of the Chinese Society of Astronautics, focuses on the challenges of international management of such threats as weaponization, debris and other environmental concerns. Mr. Yang explains that China is working on space debris research and on space environmental prediction models. He mentions the need for enhanced space object registration as one means of

improving space security. Mr. Yang reiterates that China is committed to the peaceful use of outer space.

Tragically, Dr. Rajeev Lochan from the Indian Space Research Organization in Bangalore, India, was killed in an automobile accident in August 2007. Fortunately, we have been able to move forward with his paper, which analyzes the history of the Indian space program and Indian perspectives on space security. His remarks highlight the India's unique emphasis on using space for national development, technological independence (such as in the space launch field), and international cooperation. Referring to the more than 47 missions that the Indian space program has launched, Dr. Lochan notes particularly their role in advancing agriculture, health care, and educational opportunities for the Indian population. He says that India has defined space security as the "sustainable and denial-free access to and use of space for peaceful purposes for one and all," emphasizing that space activity must provide not just corporate profits but also *redistributive* benefits to the world's population. The legacy of his contribution to this volume will hopefully push forward this worthy cause.

Dr. Setsuko Aoki from Keio University in Tokyo next draws on her legal background to review past space security treaties and agreements in hopes of providing a context for future Asian space security. She concludes that current Asian security cooperation remains weak, given the limits of existing legal restraints and a clear regional forum to address emerging space problems. However, she suggests several different measures that could be adopted by Asia in the next five years, including: better implementation of existing UN space treaties, progress on debris mitigation, the use of Article IX of the Outer Space Treaty as a confidence-building measure (CBM) among Asian states, and efforts to establish other regional CBMs for space. More concrete mechanisms, she predicts, might then be possible, beginning around 2020.

In his contribution to this volume, Dr. Kyung-Min Kim from Hanyang University in Seoul, South Korea, begins by noting that South Korea still remains behind a number of other Asian space powers. Regarding Asian space security, he emphasizes the limits of the possible, given the differences in national capabilities and the role of nationalism. After a brief discussion of the history of South Korean satellite development, Dr. Kim explains that the biggest security objective in space for South Korea is to develop a system capable of monitoring North Korean missile and nuclear developments. He also points out that South Korea has selected two astronauts for future space missions.

Dr. (and Lt. Col.) Zhong Jing from Beijing's National Defense University next outlines China's perspective on space security, explaining

that her country strongly supports the peaceful use of space, as well as comprehensive and coordinated space development. In her remarks at the April 2007 conference in Tokyo, Dr. Zhong had noted that her country had opted to develop a "limited defense capability," given the international delay in reaching agreement on a new space arms control treaty. In her paper, she discusses what she identifies as a U.S. effort to "conquer and control outer space" through its deployment of missile defenses. Dr. Zhong offers two recommendations in response: 1) the development of a consensus definition of space security; and 2) the initiation of formal discussions toward a new arrangement for preventing space's weaponization.

Wing Commander Kiran K. Nair from the Center for Air Power Studies in New Delhi, India, begins his essay by rejecting the notion of Wilsonian "collective security" in space. "Common security," he argues, is a more relevant concept, given the increased use of space assets by modern militaries, the growing number of space-faring nations with differing capabilities and intentions and emerging trends in missile defenses. On the positive side, he points out that there have thus far been no known instances of weapons deployment in space, no foreign satellite-on-satellite attacks and few ASAT tests, suggesting that space security is not yet at a critical juncture, despite 10 years of deadlock at the Conference on Disarmament. Commander Nair suggests that the international community should start instead with such "common security" topics as debris mitigation, space resource allocation, traffic management, regulation of non-state activities, and reinforcement of the Outer Space Treaty. He concludes on a note of optimism, arguing that Asian states have strong incentives to cooperate, given Asia's status as the "most disaster-prone continent in the world," its need for human development, and its ability to benefit from low-cost investments in space.

In his essay, Group Captain (Royal Australian Air Force, ret.) Brett Biddington, now of Cisco Systems in Canberra, analyzes Australia's role in international space exploration and development. He points out that while Australia has not contributed a great deal in terms of investment, it has made tremendous contributions in terms of real estate by hosting ground stations for the U.S. and U.K. militaries. In assessing the future of Australia's space program, he explains that change is on the way and that investment in Australia's space program is rising dramatically, due mainly to non-military factors, such as Australia's current 10-year drought and the desire to use space observations to track and, if possible, mitigate its effects. In terms of space security for Asia, Captain Biddington points to the need for service guarantees in the area of space utilities and enhanced

monitoring and management of the near-space environment as important emerging requirements.

Dr. Joan Johnson-Freese of the U.S. Naval War College, in Newport, Rhode Island, next discusses U.S. perspectives on space security in general, as well as specific reactions to (and implications of) China's 2007 ASAT test. As a baseline, she cites three U.S. commissions that have affected U.S. space policy: the Commission to Assess the Ballistic Missile Threat to the United States (1998), the Commission on U.S. National Security and Military/Commercial Concerns with the People's Republic of China (1999), and the Commission to Assess U.S. National Security Space Management and Organization (2001). Turning her remarks to the U.S.-China space relationship, Dr. Johnson-Freese points out how China focuses on the wide range of seemingly threatening U.S. space assets while the United States, especially after the January 11, 2007 ASAT test, focuses on the Chinese "threat" to these assets. Dr. Johnson-Freese explains that while the China threat had been an earlier theme and one against which U.S. voices of moderation had been starting to make some progress, China's ASAT test had drowned out many of these voices. Dr. Johnson-Freese concludes on a note of pessimism regarding chances for improving U.S.-Chinese space relations in the near-term and even in the next administration, given current negative trends.

Major General (Indian Army, ret.) Dipankar Banerjee, now director of the Institute for Peace and Conflict Studies in New Delhi, opens his paper by noting the major impact of the first Gulf War in forcing China and India to recognize the value of space assets for modern militaries. He predicts the "early weaponization" of space unless there is a "major intervention" by leading space-faring states. Still, he notes the possibility of collaborative approaches, noting the role of ASEAN, the Shanghai Cooperation Organization, and other agreements in promoting regional security, as well as the emergence of non-state actors interested in bridging national boundaries. But General Banerjee also quotes an *International Herald Tribune* editorial from January 21, 2007, that cautioned: "Future historians may well see Beijing's use of a missile to destroy an old weather satellite as having more lasting global impact than the Iraq War."

Dr. Kazuto Suzuki of Japan's Tsukuba University next discusses the Japanese debate on space security options. Dr. Suzuki begins with an historical discussion of the Japanese space program, addressing the debate between realism and pacifism in Japanese decisionmaking, while also citing constraints on Japan's military space developments stemming from the 1969 Diet Resolution on space activity. He points out that while Japan's space development has thus far been largely civilian and driven by non-

military technology, such events as North Korea's 1998 Taepodong missile test, the transformation of the U.S.-Japan alliance, and Japan's participation in missile defense are forcing Japan to reconsider its position and policies on space development. On the other hand, Dr. Suzuki comments that Japan's small size makes it unlikely that Japan would be well-served by space-based weapons, given the need for large numbers of systems to ensure coverage of the country at any one time. Reform of Japan's current legislation, however, may allow new military support functions using space. Japan's growing role in peacekeeping missions and disaster relief, Dr. Suzuki notes, is forcing the Japanese government to reconsider the 1969 Diet Resolution. He suggests, however, that Japan should promote regional fora for discussing space security, noting Japan's technological advantage as a rationale for possible Japanese leadership in promoting regional space cooperation.

Overall, the conference findings support the notion that while there are a range of obstacles facing international cooperation for space security, there is also a widespread interest among states in Asia to prevent future conflicts and burdensome expenditures on military space assets. How these trends will play out will depend on the success or failure of the United States in helping to define space security and in leading the disparate and sometime competing states of Asia toward new mechanism of space management, conflict prevention, and, perhaps, active cooperation.

THE CHANGING ASIAN SECURITY ENVIRONMENT

Masashi Nishihara

Today we are faced with many challenges to international security: the devastating situation in Iraq, the rising international tension over Iran's suspected nuclear arms program, the never-ending conflict between Israel and its Arab neighbors, Islamic terrorism, the increasing friction between Russia and the United States, energy security, global warming, and transnational organized crime.[1] While some of these are familiar security issues, others present new problems. All form the background for a full discussion of Asian space security issues.

Currently, the focus of the world has begun shifting toward Asia. This is partly because at this time Europe has few serious security issues that require immediate attention, with the possible exception of Kosovo, and because Asia presents new economic and military problems. The population of Asia is now about 3.6 billion people, which is more than half the world's total population. With the exception of a few countries, like Japan, these populations are growing. On the whole, the region is doing well economically, attracting huge investments from around the world and flooding the import markets, such as those of the United States and Japan, with low-cost products.

At the same time, however, the possibility of conflict in Asia may not be as small as one may think. Potential conflicts include North Korea's nuclear program, Chinese cross-strait relations, and the general internal instability in South Asia. There have also been political tensions between Japan and China and between India and Pakistan. However, in both cases the countries' leaders have managed to reduce these tensions by means of bilateral agreements. In the case of Japan and China, Prime Minister Shinzo Abe's visit to Beijing in October 2006 and Premier Wen Jiabao's April 2007 visit to Tokyo dramatically have reduced the tension between their countries. Likewise, India's and Pakistan's leaders did not abandon their

[1] [Editors' Note: This paper was written in April 2007, and therefore does not reflect changes in the global security environment that have occurred since that time.]

cooperative spirit, despite the Islamic terrorist attacks in Jammu/Kashmir and India.

NORTH KOREA'S NUCLEAR PROGRAM

The Six-Party Talks regarding North Korea's nuclear issues have made only slow progress. Beginning in 1992, North Korea agreed to abandon its nuclear program, signing three official documents: the joint declaration between North and South Korea in 1992, the Agreed Framework between the United States and North Korea in 1994, and the joint statement adopted by the Six-Party Talks in September 2005. The fourth agreement was reached again at the Six-Party Talks on February 13, 2007, but has been stalled over how the United States should arrange to release the $25 million in accounts linked to North Korea that are frozen in a bank in Macao.

In my view, North Korea's top priority was, and still is, to have these economic sanctions lifted and to secure the supplies of fuel oil promised by the other parties to the talks. But it is doubtful whether North Korea really intends to dismantle its nuclear facilities and eventually its nuclear bombs. Pyongyang's past behavior makes it difficult to be optimistic. Therefore, success in nuclear disarmament in the Korean peninsula could come only after long, difficult negotiations.

The Korean peninsula presents many other complicated political issues as well. The five other nations at the Six-Party Talks have different interests and different perspectives on the unification of the peninsula and a post-unification Korea. China, South Korea, and Russia are determined to prevent Kim Jong Il's government from collapsing. Therefore, these countries are providing economic assistance, such as fuel oil and food. Japan insists that North Korea return abducted Japanese nationals.

President George W. Bush understandably wants to achieve some diplomatic successes during his remaining months in office. This may lead to an unexpected normalization of relations between the United States and the Democratic People's Republic of Korea even before the latter abandons its nuclear weapons.

A huge concentration of hostile troops is still stationed along the DMZ on the Korean peninsula. Japan reacted negatively and strongly to North Korea's missile tests in July and nuclear tests in October of last year because it feels directly threatened by North Korea. With the support of the United States, Japan has begun to deploy its own missile defense systems. North Korea's nuclear test also ignited a debate in Japan over whether Japan should develop nuclear weapons. Even though this debate has

quieted down now, depending on how North Korea proceeds, it is likely to resurface in the future.

The Republic of Korea (South Korea) is in a precarious position vis-à-vis Washington and Pyongyang. Even though the South Korean military favors a strong alliance with the United States, President Roh Moo Hyun prefers to keep some political distance from Washington. He is seeking a more independent defense posture than past South Korean presidents and has assumed a conciliatory posture toward his northern neighbor.

CHINA'S GROWING ECONOMIC AND MILITARY CAPABILITIES

China presents different security issues for the region, particularly for Japan and the United States, and perhaps also for Southeast Asia. China's remarkable economic growth has provided enormous benefits for the region. For example, several thousand Japanese companies are now operating in China. Moreover, Japan's trade volume with China has now surpassed that with the United States, Japan's longtime largest trading partner.

At the same time, China's growing economic power is funding its defense budget and has helped expand its military activities. Indeed, its official defense budget has risen more than 10 percent every year for the last 19 consecutive years. China's defense budget for 2007 is about $44 billion, a 17.8 percent increase over the previous year. In fact, it is larger than the defense budgets of Japan at $41 billion, South Korea at $24 billion, and India at $22 billion. Moreover, because China's official defense budget does not include the cost of arms purchased from foreign countries and the cost of military R&D, its actual defense expenditure is estimated to be two to three times larger than its announced official budget.

In addition, the People's Liberation Army has expanded its military activities in the East China Sea, the Western Pacific, and also in space. A few years ago, a Chinese nuclear submarine sailed between the small southern islands of Japan, causing great concern in Japan. The Chinese government later blamed the submarine's entry into Japanese waters on a technical failure. China has successfully launched manned spacecraft into space. Its military also shot down one of its own satellites in January 2007, causing great alarm around the world. This successful experiment demonstrates China's possible ability to destroy Japanese and U.S. space-based missile defense systems, in addition to its potential to force other space-based systems into dysfunction. While Japan and the United States

have urged Beijing to make its military activities more transparent, China maintains that its military activities pose no threat to other countries.

Because of its great naval and air capabilities, the balance of power across the strait is turning in China's favor, which may be why Taiwan's government is urgently preparing for its internationally recognized independence.

INTERNATIONAL RELATIONS IN EAST ASIA

Even though the United States has strengthened its economic and military contacts with China, it still is dissatisfied with China's failure to revaluate its currency in order to reduce the huge U.S.-Chinese trade imbalance. China, on the other hand, views with suspicion the U.S. decision to strengthen its military position in the western Pacific. As part of this plan, the United States is about to refurbish and expand the military its facilities on Guam.

As mentioned earlier, political relations between Japan and China have improved. The exchange of visits by their leaders will continue, and an exchange of high-ranking defense personnel and ship visits is likely to follow. Nonetheless, Japan's concern about China's military expansion remains, as it is likely to become an even greater source of tension in the future. Currently, the two countries are planning to conduct joint naval exercises, to follow ones that have already taken place between the United States and China and between China and India. However, Japan, the United States, and India are also beginning to form cooperative relationships to balance the soaring Chinese influence in the Indian and Pacific Oceans.

Regional cooperation in the area of security was more popular in East Asia right after the Cold War. At the suggestion of the Association of South-East Asian Nations (ASEAN), the ASEAN Regional Forum (ARF) was created in 1994 to deal with regional security issues. Since then, however, it has lost its momentum, primarily because the forum has failed to progress beyond agreement on limited confidence-building measures. Its large membership makes it difficult to reach a consensus on what should be done, and today the forum has been eclipsed by the more popular idea of forming an East Asian community. The ASEAN members, plus Japan, China, and South Korea, would serve as the core of this community.

POLITICAL INSTABILITY IN SOUTH ASIA

South Asia is plagued by internal political instability. In April 2006, huge anti-monarchy and pro-democracy demonstrations were held in

Nepal, until King Gyanendra finally relinquished his political power and agreed to restore the parliament. The United Nations has been invited to oversee the peace process. Sri Lanka continues to face inter-ethnic armed struggles with Tamil separatist groups known as the "Tamil Tigers," against which the Sri Lankan military uses air and artillery strikes. Bangladesh has had violent clashes between the ruling and opposition parties and violence across the country has intensified with the rising number of Islamic terrorist acts. Though illegal, these extremist organizations have continued to expand and in August 2005 staged attacks throughout the region. It is believed that the Islamists are connected with Al Qaeda.

India must deal with two sources of internal security. The first is its long-strained relations with Pakistan. The ceasefire along the Jammu-Kashmir line, though precarious, has continued to hold, but there is little prospect for real stability. Pakistani-supported militants continue to infiltrate into Kashmir, administered by India, and they continue to carry out bombing attacks against civilians. In July 2006, Pakistani terrorists bombed suburban Indian trains. The two governments, however, have maintained their inter-state transportation links as a confidence-building measure. The other source of internal security is the group of armed rebels known as the Naxalites, or Maoists, who have expanded their violent activities in several provinces. Reportedly, there are about 9,000 rebels.

The South Asian Association for Regional Cooperation (SARC), a regional cooperation organization, was established in 1985, but made little progress, due to internal preoccupations and difficult international relations on the subcontinent. India has instead been more actively engaged in the ASEAN region and East Asia as a whole. It is a member of the ARF and the East Asia Summit. In February and March of 2006, the Indian and Singapore navies, for instance, conducted a large 10-day joint exercise off the eastern part of the Indian Ocean.

COMPETITION AND CONCERT AMONG THE MAJOR POWERS

Nearly all of the major powers with strategic interests in Asia and Eurasia call one another "strategic partners," or the equivalent. They also have varying degrees of (but generally close) economic interdependence. At the same time, however, many of them are competing for power and

influence. Most of the leaders of the United States, Russia, China, India, and Japan held bilateral summit meetings in 2006 and 2007, both to promote their bilateral relations and to put their potential adversaries off balance.

In March 2006, President Bush visited New Delhi to sign an agreement to help develop civilian nuclear reactors for India, which, despite possessing nuclear weapons, has refused to sign the Nuclear Non-Proliferation Treaty. President Hu Jintao then went to India in November 2006, and Russian President Vladimir Putin visited India in January 2007. A likely purpose of both visits was to offset American influence. In March 2007, Hu Jintao visited Moscow, where China and Russia confirmed their cooperation in curbing U.S. pressure to settle such international security issues as Iran's nuclear program and Myanmar's violations of human rights. Earlier, in Shanghai in June 2006, China and Russia hosted the annual Shanghai Cooperation Organization meeting and invited President Mahmoud Ahmadinejad of Iran to attend as an observer. His attendance underscored the participants' criticism of the United States. Yet, Russia and China have competed for influence in Central Asia, particularly in Kazakhstan, where each has sought to gain favorable access to energy resources. President Hu Jintao was in the United States in September 2005 for a summit conference with President Bush. The two leaders met again during the APEC summit meeting held in Hanoi in November 2006, at which they stressed the importance of cooperating on economic and security issues, despite sources of strain between them.

As mentioned earlier, the Japanese prime minister visited China in October 2006 and his Chinese counterpart made a reciprocal visit to Japan in April 2007. Japan also has cultivated strategic relations with India, when Prime Minister Junichiro Koizumi visited in April 2005 and Prime Minister Manmohan Singh made a return visit to Tokyo in December 2006. Prime Minister Abe, seeking Japan's greater presence in international affairs, has stressed the need for "assertive diplomacy." His government is promoting the idea of connecting new democracies in Southeast Asia, Central Asia, and Eastern Europe and of building an "arc of freedom and prosperity." In March 2007, the leaders of Japan and Australia also signed a joint declaration on security cooperation.

CONCLUSION

As economic interdependence and globalization deepen, both developing and developed nations find it imperative to cooperate with each other, despite the intensified competition for energy resources and foreign

investment. Unlike the nations of the European Union, most nations in the Asia-Pacific region still favor national sovereignty, which often becomes a source of regional tension. The region thus presents many security challenges that it must strive to overcome.

A SOUTH KOREAN PERSPECTIVE ON STRENGTHENING SPACE SECURITY IN EAST ASIA

Changdon Kee

The purpose of this study is to briefly review the current status of space technology in Korea and to discuss relevant issues in the context of the eight indicators developed by the publication *Space Security Index* to determine the quality of "space security" at any given time.[1] These indicators are: the space environment; laws, policies, and doctrines; civil space programs and global utilities; commercial space; space support for terrestrial military operations; space systems protection; space systems negation; and space-based strike weapons. These indicators contain all the important issues for space security, from space debris problem to space-based navigation systems.

Space security is defined by the *Space Security Index* as "the secure and sustainable access to, and use of space, and freedom from space-based threats."[2] For the purposes of this discussion, the analysis will focus on possible means of improving space security from a South Korean perspective.

SPACE TECHNOLOGY IN SOUTH KOREA

The history of space technology in South Korea (or the Republic of Korea, ROK) began in the late 1980s. The ROK's aeronautics and space agency is the Korea Aerospace Research Institute (KARI). KARI was founded within the Korea Institute of Machinery & Materials (KIMM) in October 1989. To cope with the increased importance of space-related technology, KARI became an independent organization in October 1996. The task of KARI is to conduct research on and to develop aircraft, satellites, and launch capabilities.

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[1] See the *Space Security Index* at: http://www.spacesecurity.org.
[2] Ibid.

The first completely indigenous ROK satellite, *KITSAT-1* (Korea Institute of Technology Satellite-1, or *Uribyol-1* in Korean) was launched by on an Ariane-4 rocket on August 11, 1992. *KITSAT-1* was developed as a collaborative project with University of Surrey in UK. After the success of the first satellite, *KITSAT-2* and *KITSAT-3* were successively developed and launched in 1993 and 1999. Based on these advancements in technology, South Korea has launched a series of multi-purpose satellites since the late 1990s. *KOMPSAT-1* (KOrea Multi-Purpose SATellite-1, or *Arirang-1*) carries an electro-optical camera, an ocean-scanning multi-spectral imager, and a space physics sensor. It was launched from Cape Canaveral on a Taurus rocket in December 1999. Its successor, *KOMPSAT-2* includes a one-meter multi-spectral camera payload that can provide one-meter panchromatic and four-meter, multi-spectral image data. *KOMPSAT-2* was launched into orbit on July 28, 2006, aboard a Eurockot launcher from Russia's Plesetsk cosmodrome.

South Korea also has several communication satellites. The most recent, the ROK's first joint civilian-military communications satellite, *Mugunghwa-5*, built by the French company Alcatel, was placed into orbit by the Sea Launch consortium on August 22, 2006. In addition, South Korea co-owns one digital multi-media broadcasting satellite with Japan. This satellite, built by Space Systems/Loral for SK Telecom (ROK) and the Mobile Broadcasting Corporation of Japan, called *MBSat*, was launched by an International Launch Services Atlas III rocket from Cape Canaveral Air Force Station on March 13, 2004. It now delivers high-quality music, video, and data to mobile users in South Korea and Japan through a variety of mobile terminals, including those in cars, handheld terminals, personal digital assistants, and cellular phones. Only a very small antenna is necessary to receive these broadcast signals, even inside buildings and in vehicles moving at high speeds. Recently, KARI has prepared another multi-purpose satellite project. It is for a multi-function geostationary satellite called *COMS* (Communication, Ocean, and Meteorological Satellite). The highly advanced *COMS* has three payloads: one for meteorology, one for ocean observation, and one for communications. *COMS* is KARI's first geostationary satellite and will provide South Korea with its own independent meteorological and ocean data.

KARI also built a test bed for orbital launch vehicle technologies. This effort developed the Korean Sounding Rocket (KSR), starting in 1990 with the solid-fueled KSR-I. A follow-on version, the KSR-II was flown in 1997 and 1998. The program ended in 2002 with the three-stage, liquid-fueled KSR-III. The test program provided useful experience for engineers and valuable data for R & D on guidance and control systems for a future

satellite launch vehicle. Launch vehicle development in the 1990s, however, was delayed by a bilateral agreement with the United States limiting the range of the ROK's ballistic missiles to 180 km. But this agreement was superseded by South Korea's entry into the Missile Technology Control Regime in 2001, which makes it possible for the ROK to develop its own space launch vehicle (SLV). The KSLV-1, South Korea's first indigenous launch vehicle will lift 100 kg. to low-Earth orbit (LEO), and the upcoming three-stage version planned by 2015 will lift 1,500 kg. to LEO. South Korea signed contracts for a new Korean space launch vehicle and space launch center at Goehung with the Russian company Energiya in 2004. The launch center is called the "Naro Space Center" and is located at the southwestern tip of the Korean peninsula, which will allow launches for LEO, geo-stationary orbits, and polar orbits. The first phase of construction began in 2003 and is expected to be completed near the end of 2008 for launch of the KSLV-1. Construction is scheduled to be fully completed by 2015. The launch complex will include a launch site, control tower, vehicle assembly building, test stands, and simulators.

By developing independent satellite design, manufacturing, and launch capabilities, South Korea aims to become one of the top 10 aerospace countries in the world by 2015. In 2001, the South Korean government released a master plan called the "National Space Program" for achieving this goal, and a new round of investment was made totaling $4.26 billion.[3]

Recently, the South Korean government established another significant national master plan called the "National GNSS Plan" on December 13, 2005. It contained the organization of an interagency unit for establishing and driving a national policy related to the GNSS. According to this plan, the ROK will implement its own space-based augmentation system with the multi-function geostationary satellite, *COMS-II*. The development of this first navigational satellite is planned to begin in 2009. Another key point of this plan is participation in the European Union's Galileo project. On September 9, 2006, the ROK and the EU signed a cooperative accord for the Galileo project.[4]

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[3] H. Paik, "Space Programs of Korea," March 7, 2007, online at: http://www.prime-intl.co.jp/expsympo/material/7_4_Hong-Yul.pdf.

[4] National Science & Technology Council of Korea, "National GNSS Plan," Dec. 13, 2005.

Space Security Issues of Concern to South Korea

In regard to the space technology developed by the ROK to date, it is worth considering its relation to the following space security issues:

- Prevention of an Arms Race in Outer Space (PAROS);
- Frequency spectrum and orbital slot allocation;
- Space debris mitigation; and
- Satellite-based navigation and augmentation systems.

On the PAROS issue, South Korea has made statements at the UN Conference on Disarmament (CD) supporting the increased use of confidence-building measures. As Ambassador Chang Dong-hee stated at the CD on June 8, 2006:

> The possibility of an arms race using advanced space and related technologies, as well as the proliferation of space debris, by-products of increased space activities, all give rise to an important question: how should we safeguard the uninterrupted and free use of outer space for peaceful purposes.
>
> Confidence-building measures constitute one of the most important aspects in the whole process. These may include building up support for an effective regime, readiness to negotiate it and, once agreed upon, the full and effective implementation of it. For this, we may need to start by seeking ways to strengthen effective compliance by current space-faring nations with existing agreements, such as the Registration Convention of 1975. [5]

Similarly, then-South Korean Minister of Foreign Affairs and Trade Ban Ki-moon stated at the CD on June 20, 2006:

> On the prevention of arms race in the outer space, like many other countries, the Republic of Korea has greatly benefited from space-based technologies. We are keen to

[5] Cited on the "Current and Future Space Security" web pages, website of the Monterey Institute's Center for Nonproliferation Studies, online at: http://cns.miis.edu/research/space/skorea/index.htm.

> safeguard the uninterrupted and free use of the outer space for peaceful purposes. We welcome the in-depth CD debate on PAROS. In light of the complicated nature of the related issues, we believe a gradual and pragmatic approach is sensible at this state.[6]

As more countries develop their own space programs, fewer space resources are available. For this reason, countries need to consider more efficient and optimal means of using space resources. The most common and important space resources today are radio frequencies and orbital slots. There is especially explosive growth in the demand for use of geostationary orbital locations. One of the obvious solutions of this problem is to make a multi-function satellite that can carry out two, three, or even more functions, which are now provided by multiple satellites. South Korea is spurring the development of a multi-function geostationary satellite, COMS. This methodology could help overcome the problem of limited resources.

Another approach for solving these problems is enhanced international cooperation. Sharing a satellite for common purposes by two or more states can enhance both the efficiency and security of space-based systems. The digital, multi-media broadcast satellite shared by South Korea and Japan provides a positive example.

In 2008 or 2009, South Korea will launch its own LEO satellite by its own first space launch vehicle. This event will be one of the most significant milestones in the history of space technology in Korea. However, launching a space launch vehicle inherently contributes to the space debris problem. Space debris has become a growing concern in recent years, since collisions at orbital velocities can be highly damaging to functioning satellites and can also produce even more space debris in the process. It is important to monitor and reduce extant space debris. However, it is more important, especially for South Korea, to prevent or mitigate debris in advance. A number of measures to mitigate space debris have been proposed. These can be applied to satellites and space launch vehicles. South Korea should consider adopting advanced technology for mitigating space debris through the development phase of its upcoming satellites and space launch vehicles. For this task, it is preferable for the advanced countries to share relevant technology to the maximum extent.

The Global Navigation Satellite System (GNSS) now has very wide applications, ranging from personal navigation to smart bombs. The

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[6] Ibid.

use of space-based global navigation has grown dramatically over the last decade since 1995, when the U.S. GPS (Global Positioning System) declared its full operational capability. Because of its huge strategic and economic value, the number of countries developing their own satellite navigation systems has grown, from two (the United States and the Soviet Union) in 1990 to six in 2007. The U.S. GPS is the best known, and now is only the fully operational GNSS. Russia also operates its own GNSS called GLONASS (GLObal Navigation Satellite System), which is currently not fully deployed. The EU is pushing the development of its own Galileo system. China recently has released the plan for its own global system, COMPASS (or Beidou). Japan and India have plans to build a regional system, the QZSS (Quasi-Zenith Satellite System) and IRNSS (Indian Regional Navigational Satellite System), respectively. In addition, many countries have plans to build or deploy regional augmentation systems, which improve the current GNSS to achieve higher performance, especially to improve accuracy and integrity of systems for aviation and other uses. We call these regional augmentation systems: Satellite-Based Augmentation Systems (SBAS). The newly developed commercial GNSS receivers support SBAS functions so that users can acquire higher navigation performance. Because GNSS and its augmentation systems have become so widely used and part of the indispensable infrastructure for modern societies, the security of these systems has become one of the most important issues for ensuring space security.

Developing or developed GNSS augmentation systems are the U.S. WAAS (Wide Area Augmentation System), the EU EGNOS (European Geostationary Navigation Overlay Service), the Japanese MSAS (MTSAT Satellite-based Augmentation System), the Indian GAGAN (GPS and GEO Augmented Navigation), the Australian GRAS (Ground-based Regional Augmentation System), and the Chinese SNAS (Satellite Navigation Augmentation System). The U.S. WAAS is the only certified operational system, currently. Recently, South Korea also released a master plan for developing its own SBAS.[7]

But a question needs to be raised: is it really necessary for each country to have its own separate GNSS augmentation system, especially within the East Asian region? The countries of East Asian region could enjoy significant benefits by cooperating each other. But to achieve such cooperation, these states need to overcome certain technical and political

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[7] D. Kim, Y. Yun, B. Park, S. Jeon, Y. Sohn, and C. Kee, "Development and Preliminary Test Results of Korean WADGPS Test Bed Using NDGPS Infrastructure in Korea," ION GPS/GNSS 2006, Fort Worth, TX, September 2006.

barriers. As a very attractive candidate solution, this study proposes a decentralized approach for implementing a regional SBAS.

The core concept of the SBAS is based on a station-network, which usually comprises Wide-area Reference Stations (WRSs) and Wide-area Master Station (WMS). Multiple WRSs observe all GNSS satellites in view and the collect necessary measurements. The WRSs then send their raw measurement data to a central processing facility, or the WMS. The WMS processes the raw data to generate wide-area differential corrections and integrity messages. Taken together, the generated SBAS messages are transmitted to users via geostationary satellites. Using the broadcast messages, users calculate their positions and related protection levels with a desired level of performance. In short, all the current SBASs use a standard centralized architecture, in which all the raw-level, security-critical data observed by local sensors, namely the WRSs, are converged into one central processor, the WMS. While producing an optimal estimate, this framework may experience an overwhelming concentration of raw measurements and a high computational load to the central processor. In fact, the WMS has such predominant power over the whole network that the sovereignty of WMS will be a critical issue among interested parties. (Figure 1, printed at the end of this paper, provides an overview of the SBAS in East Asia.)

Yet, a standard centralized SBAS hardly seems to be a natural solution for the East Asian region. In an attempt to ultimately achieve real-time implementation of an SBAS in East Asia, international collaboration among the interested Asian countries is essential. But the region has a deep-rooted heterogeneity with respect to historical and political background. These differences affect policies on whether the nation possessing sovereignty over a WMS can be trusted as a security partner. On the grounds of an excessive concentration of raw measurements and a lack of mutual confidence, each country might hesitate to participate in a single-nation SBAS or a multi-nation, Asian-wide SBAS network.

To mitigate these impediments, this paper proposes a new version of an SBAS with decentralized parallel-processing capabilities. A decentralized hierarchical architecture would provide augmentation to overcome the structural deficiencies of existing architecture and would also solve the control issue of the network by distribution of the exorbitant responsibilities of the central processor into several local processors, thus guaranteeing operational independence within a homogeneous local area. (Figure 2 outlines a scheme for separate regional systems, and Figure 3 shows the conceptual view of the proposed decentralized SBAS.) Therefore, it could more easily induce constructive engagement in the

Asian SBAS project and eventually promote the feasibility of this project. As a result, cooperation between participant countries would ensure the security of the operational system and improve overall efficiency,[8] as well as providing significant benefits to non-participant countries.

Conclusion

South Korea is systematically developing space technology on the basis of its "National Space Program." Before 1992, South Korea had no satellites; now it has total of 11 operational satellites, including seven in LEO and four in GEO. Its space agency, KARI, is now concurrently carrying out several development projects for multi-purpose satellites, space launch vehicles, the Naro space center, a space-based regional augmentation system, and other efforts.

As South Korea extends its horizon of space technology, more responsibility for ensuring space security will be required. Therefore, South Korea now needs to consider space security issues, including the efficient use of orbital and frequency slots, the peaceful uses of outer space, space debris mitigation, and secure construction of a regional augmentation system for GNSS. One core measure to ensure space security is international cooperation supported by advanced technology. The successful operation of *MBSat* between South Korea and Japan is a good example. This paper has proposed a "Decentralized GNSS Augmentation System in Asia" as a technological challenge for overcoming political barriers. This methodology could be an important first step in helping to develop confidence-building measure for further space security cooperation among East Asian countries.

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[8] C. Kee, and C. Pyong, "A Solution of a Natural Way to Implement WADGPS in East Asia: Decentralized WADGPS," Proceedings of the ION GPS-99, Nashville, TN, September 1999.

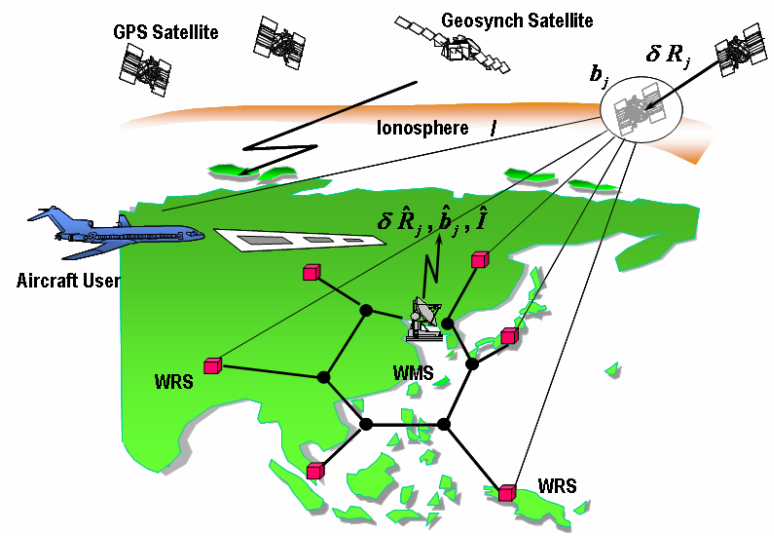

Figure 1. Overview of SBAS in East Asia

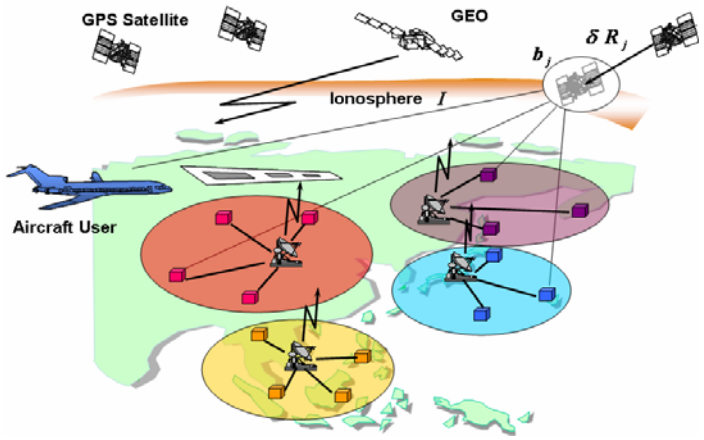

Figure 2. Independent and centralized regional systems

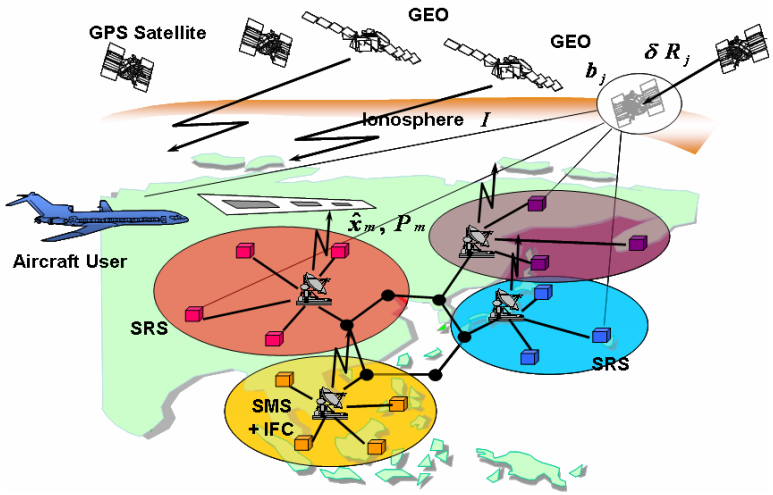

Figure 3. Decentralized SBAS concept

DEVELOPING SPACE PEACEFULLY FOR THE BENEFIT OF HUMANITY

Yang Junhua

Like the land, ocean, and sky, space has become an indispensable part of human life. In the past 50 years, human beings have made many accomplishments in the fields of space exploration, space development, and space applications. These achievements have greatly promoted social progress and technological development and deepened people's understanding of the universe. Space technology has played an increasingly important role in such fields as economic construction, cultural development, social progress, scientific research, and security. Therefore, the peaceful use of space should be a common aspiration of people all over the world.

CHINA'S SPACE ACTIVITIES

A comprehensive space industry system of research, design, production, and testing has been developed in China. Various types of launch vehicles and satellites have been developed and manufactured. Space-launch centers that are capable of boosting satellites of various types, as well as manned spacecraft, have been established. A space tracking, telemetry, and command network, which consists of ground stations and oceangoing tracking and telemetry ships, has also been put in place. A number of satellite application systems have been set up. In addition, a space scientific research system of a fairly high level has been established.

China has independently developed and launched more than 70 satellites of various types that have primarily fallen into seven categories: returnable remote-sensing satellites; *Dongfanghong* (Red East) communications and broadcasting satellites; *Fengyun* (Wind and Cloud) meteorological satellites; *Haiyang* (Ocean) satellites; *Ziyuan* (Resources) Earth observation satellites; *Beidou* (Compass) navigation and positioning satellites; and *Shijian* (Practice) scientific research and technical-experimental satellites.

By the end of 2006, China's Long March launch vehicles had conducted a total of 95 flights, including four flights of unoccupied, man-rated spacecraft and two flights with humans aboard (in 2003 and 2005). Since October 1996, 54 consecutive flights of the Long March launch vehicle have been conducted successfully. China has also initiated a lunar exploration project.

Space technology has been transformed into a socio-economic tool through space applications. It has played a key role in such fields as meteorological forecasting, ocean development, environmental protection, disaster monitoring, water conservation, mapping, earthquake prediction, and so on. China's space industry is now serving the national economy and promoting scientific and technological progress.

CHALLENGES HUMANS FACE IN EXPLORING SPACE

While people have made great achievements by exploring the space, they are also facing critical challenges. First, if space is weaponized, the space assets of all countries will be endangered and international peace and security be threatened. The result will be so terrible that people dare not think about it.

Second, space debris is the castoff of space activities and constitutes the main source of pollution of the space environment. With frequent space activities, more and more space debris is being accumulated. Space debris is severely endangering near-Earth spacecraft and threatening the security of terrestrial life and ground-based assets. Especially when spacecraft powered by nuclear energy de-orbit, they produce chemical and radioactive pollution. The results are severe.

Third, some space environmental factors, such as upper-atmosphere, high-energy charged particles, space plasma, and micrometeoroids can produce spacecraft radiation damage, mechanical damage, chemical damage, surface charging and discharging, electrical hardware and software errors, communication and telemetry disturbance, and other space environment effects that will greatly damage spacecraft and astronauts traveling in space.

Fourth, with the active participation of private enterprises in the space field, how governments supervise their activities and how international responsibilities will be shared are issues that will affect the healthy development of space activities.

MEASURES CHINA HAS TAKEN TO MEET THESE CHALLENGES

SPACE DEBRIS RESEARCH

In 1990, China started space debris mitigation work. In June 1996, China officially joined the Inter-Agency Space Debris Coordination Committee. China has participated in international joint observation of "Space Dangerous Objects Reentry." In 2001, China started its "Space Debris Action Plan" to strengthen research on space debris observation, mitigation, and prevention.

After many years of efforts, China has made great progress in the space debris research field. China has independently developed a space debris early-warning system. Earth-based exploration measures have been improved. A small-scale space debris database has been established. Spacecraft launch and on-orbit collision early-warning technology has been mastered. Super-speed collision basic equipment has been developed. Computer simulation capability has been established. The problem of preventing the breakup of the upper stage of the current launch vehicle has been basically solved. The first "List of a Standard Frame System for Space Debris" has been developed. An "Action Plan for Space Debris (2006-2020)" had been elaborated. And aircraft space debris mitigation technology research has also been carried out.

In 1990, China began to carry out research on the post-mission passivation of the LM-4 three-stage launch vehicle. Through analysis of the mechanism of on-orbit, post-mission breakup of the third stage of the LM-4 launch vehicle, China developed a vent system for the LM-4 to vent residual propellants into a tank with residual gas in the high-pressure vessel after the separation of the satellite and rocket. The vent system was first used for the launch of the FY-1C meteorological satellite in 1999. Since then it has been further improved and the LM-4B launch vehicle with the vent system has carried out eight launches, all of which completing the venting operation successfully.

China also designed a residual propellant vent system for the second stage of China's LM-2D launch vehicle, which is used to launch solar synchronous satellites. On July 6, 2005, LM-2D performed a vent operation for residual propellants after completing its launch mission. Cryogenic propellants are used for the third stage of the LM-3 launch vehicle family that is used to launch geosynchronous satellites. According to the characteristics of the propulsion system of such rockets, a unique research task has been carried out. At present, the technical research and design draft of the venting system for removing residual propellants from

its third stage into a tank after separation of a satellite and launch vehicle has been completed.

China will take similar, step-by-step measures to control space debris produced by launch vehicles in its future launch activities.

LIST OF A STANDARD FRAME SYSTEM FOR SPACE DEBRIS

In 2006, China prepared its "List of a Standard Frame System for Space Debris" (first edition), which lays out the various standards needed for the study, application, and management of space debris mitigation and the establishment of this field of study, with the required subordination of structures and relations among the nature, category, and standards that make up the system frame. The publication of China's "List of a Standard Frame System for Space Debris" indicates that China is gradually achieving the standardization of techniques for mitigating space debris and is taking an important step toward protecting the outer space environment.

ACTION PLAN ON SPACE DEBRIS (2006-2010)

An "Action Plan on Space Debris (2006-2010)" has been worked out by experts from different fields under the leadership of the China National Space Administration (CNSA). This plan puts forward the tasks and objectives of China's space debris study from 2006 to 2010, the technical approaches to realize them, and the main research topics. It attaches importance to three projects: 1) a space debris early-warning project, based on a database; 2) a space debris protection project, based on a defense-design expert system; and 3) a space environment protection project, based on space debris mitigation design standards.

Since 2006, China has put stress on mitigation technology for space debris generated by spacecraft and arranged the following research projects: research on post-mission disposal strategies for GEO satellites and related technologies; research on the passivation of post-mission LEO spacecraft; research on the mitigation of operational debris generated from all kinds of scientific research and technological experiment satellites and application satellites; and research on the safety evaluation of spacecraft reentry.

Additionally, with the concrete implementation of space debris mitigation measures, China has begun research on technology for the evaluation of the effect of the measures of space debris mitigation to insure that the plan for the mitigation of space debris will be best suited to the goal of the protection of the near-Earth space environment.

In the beginning of the 1960s, China began to carry out space environmental research. Then, China mainly studied the influence of high-energy charged particles in the Earth's radiation belts on satellites and calculated the high-energy proton and electron flux that would possibly be met by China's first man-made satellites in orbit. In the beginning of 1990s, China carried out much wider space environmental research and established a space environmental research laboratory, a space environmental exploration research laboratory, a data center, a space environmental prediction center, and other research organizations.

China's space environment exploration research focuses on the study of the space environment and its effects on spacecraft. This research consists of probing and monitoring: high-energy electrons, protons, and heavy ions and their single-event and radiation dose effects, hot plasma and its charging effect, upper atmospheric density and composition, ultraviolet atmospheric ozone exploration, space physics initiative experiments, spacecraft electric digital initiative control, solar electromagnetic radiation, and similar topics. The research also includes ground simulation experiments of the space environment and its effects, as well as laboratory study of protective measures against harmful space environmental effects. In 1996, China published the "LEO Spacecraft Space Environmental Brochure." At present, China is developing and manufacturing space environmental monitoring equipment for various spacecraft (such as meteorological satellites, Earth resources satellites, and scientific-experimental satellites), researching and monitoring environmental event warning, and researching and developing manned spaceflight engineering. Some specific examples of recent activities follow below.

THE GEOSPACE DOUBLE STAR SATELLITE EXPLORATION PROJECT

On July 9, 2001, China and European Space Agency (ESA) signed a cooperation agreement with respect to the Geospace Double Star Satellite Exploration Project (DSP). China's "*Tance* (Exploration)-2" satellite operated together with four of ESA's exploration satellites in space. The world's first joint, simultaneous six-point exploration of geospace was thus realized.

Specifically, the Geospace DSP is investigating the trigger mechanism of magnetospheric space storms and the physical processes of the disastrous geospace weather during solar activities and interplanetary disturbances, and then establishing models to describe and predict the spatial and temporal variations of the near-Earth space environment. With

this program, the security of future spacecraft activities will be guaranteed effectively.

SPACE ENVIRONMENTAL PREDICTION RESEARCH

China has carried out research and forecasting on space environmental science, made forecasts and predictions on space environmental factors, and provided relevant measures to improve the security of space engineering. To date, China has carried out the following space environmental prediction research.

First, it is providing special space environmental predictions and warnings, effects forecasts, real-time analysis and diagnosis of abnormal situations, and releasing regular space environmental forecasts. Second, it is carrying out top-level design and strategic development research for space environmental security and research on key exploration measures and technological systems. Third, China is collecting space environmental monitoring data to establish, maintain, and operate a space environmental information system and real-time data exchange network. Fourth, it is carrying out research on space environmental prediction measures, prediction technology, prediction modes, and numerical value predictions. And, fifth, it is conducting research on space environmental effects in order to develop countermeasures for reducing and eliminating harmful environmental effects, while developing design standards, regulations, and guidelines for spacecraft.

CHINA'S SPACE POLICIES: REGULATIONS AND WHITE PAPERS

China has issued and published a series of laws, regulations, provisions and related documents to explain in detail China's objectives, aims, basic principles, and positions in space activities.

Two sets of regulations govern the activities of civilian space activities. China's first domestic regulations on the "Administration Methods for Space Objects Registration" were published in 2001. These regulations define the concept of a space object and lay out the obligations and procedures for their registration. In 2002, China also released the "Interim Measures on the Administration of Permits for Civil Space Launch Projects."

Beginning in 1998, the Chinese government began publishing a biannual paper on China's National Defense. These white papers serve to explain China's concepts and policies on national defense. Each white paper has one chapter devoted to arms control and disarmament issues, in

which China declares its consistent opposition to an arms race in outer space. "China's Space Activities," released in 2000, was the first white paper on space published by the Chinese government. This document reviewed China's then-current situation in regard to space technology, space applications, and space science. It also provided guiding principles and core policies for China's space activities, as well as setting priorities for international cooperation. In addition, concepts and goals for future development have also been an important part of the white papers. Released soon after this, the white paper "Chinese Civil Space toward the 21st Century" further explained China's policies in its civil space activities. In 2006, "China's Space Activities in 2006" was published. It reiterates many of the key concepts of the White Paper released in 2000.

CHINA'S ACTIONS AND INITIATIVES TO PROMOTE SPACE SECURITY

In 1980, China became a member of the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS). Since then, China has participated in all the meetings of COPUOS, as well as the annual meetings held by its Scientific and Technical Subcommittee and Legal Subcommittee. During the 1980s, China acceded to the "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies," the "Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space," the "Convention on International Liability for Damage Caused by Space Objects," and the "Convention on Registration of Objects Launched into Outer Space." It strictly fulfills its related responsibilities and obligations.

China has signed cooperative agreements on the peaceful uses of outer space and on space project cooperation with Argentina, Brazil, Canada, France, Malaysia, Pakistan, Russia, Ukraine, ESA, and the European Commission, and established a space cooperation subcommittee (or joint commission mechanism) with Brazil, France, Russia, and Ukraine. China has also signed cooperative memorandums with the space organizations of India and the United Kingdom, and conducted exchanges with space-related bodies in Algeria, Chile, Germany, Italy, Japan, Peru, and the United States. Among them, Sino-Brazilian space cooperation is a model of South-South cooperation.

In October 2005, the representatives of China, Bangladesh, Indonesia, Iran, Mongolia, Pakistan, Peru, and Thailand signed the Asia-Pacific Space Cooperation Organization (APSCO) Convention in Beijing. In June 2006, Turkey signed the Convention as well. In October 2006,

APSCO became effective officially; the organization is now headquartered in Beijing.

China has actively participated in activities organized by the Inter-Agency Space Debris Coordination Committee, which China officially joined in June 1995. China has participated in relevant activities organized by the Committee on Earth Observation Satellites (CEOS). In addition, China has taken part in relevant activities of the International Telecommunications Union (ITU), the World Meteorological Organization (WMO), the International Astronautical Federation (IAF), and the Committee on Space Research (COSPAR).

China has extensively carried out bilateral, regional and multilateral cooperation and made due contributions to the promotion of the peaceful uses of the space.

China aims at concluding an international legal instrument devoted to preventing the weaponization of and an arms race in space as soon as possible. To regulate the activities carried out in space by all countries, the international community has concluded a number of legal instruments that have played a positive role in promoting the peaceful exploitation and utilization of space. However, they are not adequate to effectively prevent an arms race in and the weaponization of space.

First of all, there are some obvious flaws and loopholes in existing agreements. The scope of prohibited activities, as provided for by some instruments, is very limited. For example, the 1967 Outer Space Treaty only prohibits the deployment of nuclear weapons and other WMD in space, but not other types of weapons. And some other treaties have too few signatories, such as the 1979 Moon Agreement.

Secondly, these instruments do not reflect the reality of the development in space technology, especially the research and development of space weapons over the last two or three decades.

Given this situation, it is imperative to conclude an international legal instrument devoted to preventing the weaponization of space and a possible arms race. Early conclusion of an international legal instrument on the prevention of space weaponization will help preserve the peaceful use of space, facilitate relevant international cooperation, and enhance the common security of all countries.

China also seeks to strengthen resource sharing and develop a cooperative work plan for space. The international community should further strengthen the system for sharing data on space debris research and space environmental monitoring and warning to allow countries to communicate with one another, access data openly, and carry out favorable exchanges.

CONCLUSION

In the 21st century, people are more and more dependent on space. Human beings, therefore, should strengthen international cooperation in the space field. International cooperation should be based on the UN General Assembly's "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," which was approved at this body's 56th session. The international community should strengthen cooperation with developing countries, promote the improvement of developing countries' capabilities in the space field, continue to carry out space cooperation among developed countries, and spare no efforts to establish a peaceful and secure space environment to make space technology serve human beings better.

SOME REFLECTIONS ON COLLECTIVE SECURITY IN SPACE

Rajeev Lochan[1]

The Indian approach to space has been shaped by a desire to contribute to the development of Indian society. Due to their enormous potential for enhancing the quality of people's lives, three sectors were hand-picked for development: satellite communications, weather/climatology, and remote sensing. Telecommunications were recognized as the crucial vehicle for modernization and for weaving the entire country into one fabric. Remote sensing derived its usefulness from its ability to touch almost all walks of life—agriculture, water resources management, urban planning and development, preservation of the environment, and disaster management support. These objectives led to two national space systems—the Indian National Satellite (INSAT) system for telecommunications and meteorology and the Indian Remote Sensing (IRS) satellite for natural resources management. The Indian Space Research Organization (ISRO) has managed India's space systems since their inception.[2]

India chose the tougher route of self-reliance for realization of these systems over the easier alternative of obtaining foreign space services under cooperative or commercial terms. Self-reliance was targeted as a strategy for sustainable development, since large-scale benefits can accrue

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[1] All the opinions expressed herein belong to the author and do not represent those of his employer or his country. The author heartily acknowledges his colleagues at ISRO for many fruitful discussions he had with them during the preparation of the manuscript. Of special mention is Mr. V. Sundararamaiah, Scientific Secretary ISRO, who suggested valuable enhancements. Dr. M. Y. S. Prasad has not only shared his profound thoughts on the issues related to space security, but also undertook the pain of examining this manuscript and suggesting valuable improvements. The author has greatly benefited with his fruitful discussions with Mr. K. R. Sridhara Murthi and D. Narayana Moorthi. The author is indebted to Mr. V. Gopalakrishnan for sharing the outcome of his research in various aspects of space security. Any errors contained herein remain entirely the author's.

[2] For greater detail on the Indian space program, see the website of the Indian Space Research Organization at: www.isro.org.

to a large country like India only when it has its own space industry specifically tailored to meet its needs.[3] Moreover, this strategy instilled immunity against technology denial and the perils of "export control," which have served foreign objectives and vested commercial interests under the guise of "security" concerns. Today, India has complete end-to-end indigenous capability in the remote-sensing arena as well as in telecommunications.

The Indian approach to space has yielded rich dividends. India is now self-reliant in space. Most technologies have been absorbed and mastered, although not all of them have been put into mass production. Remarkable benefits have reached the society in a very timely and cost-effective manner.

PERCEPTIONS OF SPACE SECURITY

This glimpse of the Indian space program shows convincingly that the Indian space infrastructure built over four decades and the operational services it carries are vital to the nation, encompassing virtually every aspect of development—food, water, health, education, communication, environmental protection, and many others. The security of this infrastructure, its renewal and expansion as needed, and the uninterrupted and assured continuity of its operational services form the core of India's concerns about space security.

This concern with space security is not unique to India. Developing countries, and, more so, developed countries, crucially depend upon space services today. Space has emerged as a critical infrastructure and an instrument of growth and prosperity. Its security is vital to all of humanity. In fact, human existence and its sustained prosperity crucially depend upon space.

Out of the many definitions for "space security" widely used in the literature, the proposal contained in the publication *Space Security 2004*—"Secure and sustainable access to and use of space, and freedom from space-based threats"[4]—comes quite close to the author's view. Yet, two noteworthy omissions are noticeable. In my opinion, the following enhanced definition would be more appropriate: "Secure, sustainable, and denial-free access to and use of space *for peaceful purposes and for one and all*."

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[3] U.R. Rao, "Remote Sensing for National Development," Indian Space Research Organisation, ISRO-SP-56-91, October 1999.

[4] See Spacesecurity.org, *Space Security 2004*, pp. 1 and 185.

Needless to say, the concept of "denial-free access to and use of space" for *non-peaceful purposes* is counter to the underlying principles of space security. In the same vein, "denial-free access to and use of space" *for one and all* is key to sustainable, long-term security.

As Narayana Moorthi has noted: "The term '*spacepower*' is used normally with the meaning of might. However, here it is appropriate to describe it as the demonstrated ability to use the *power of space for human welfare* [emphasis added]."[5] Although not directly relevant to the present discussion, this apt analysis captures the essence of "collective security" in space.

A closely related concept is that of "peaceful purposes." By omitting a legally binding definition of "peaceful purposes," the Outer Space Treaty[6] of 1967 permits the dichotomy of interpretation from the minimalist concept of "non-aggressive" to a maximalist vision of "non-military." The maximalist interpretation, which was more prevalent in the beginning of the space age, has now given way to the minimalist concept as demonstrated by state practice, which has not been contradicted in a forceful manner by any state formally protesting military utilization of space.[7] State custom over the past 40 years has slowly erased the distinction between "peaceful" and "non-aggressive." Thus, while space assets have been used extensively to support terrestrial military operations, states have stopped short of actually deploying weapons in space.[8]

It would be naïve to attempt to turn the clock back and to re-establish the connotation of "peaceful" as it was prevalent in the early stages. Pragmatism consists in gracefully accepting the minimalist definition of peaceful as "non-aggressive" and taking on the far more serious challenge that the international community is now faced with, of the possible qualitative shift from the current military use of outer space, which is passive and non-destructive, to active military use of space and deployment of space weapons.

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[5] D. Narayana Moorthi, "What 'Space Security' Means to an Emerging Space Power," *Astropolitics* (Summer 2004), p. 261 (in Abstract).

[6] The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (General Assembly resolution 2222 (XXI), annex)—adopted on December 19, 1966, opened for signature on January 27, 1967, entered into force on October 10, 1967.

[7] UN Document. CD/1165 of 12 August 1992.

[8] *Space Security 2004*, p. 23.

PROMISING PATTERNS

Fortunately, international consensus-based approaches to address potentially grave security threats—man-made or natural—are not as rare as is widely perceived. International efforts towards disaster management[9] and environmental degradation are two examples. Three areas related to space deserve more detailed analysis.

SPACE DEBRIS

The serious threat posed by space debris to the peaceful uses of outer space can hardly be overemphasized. Given that the capability to monitor these tiny "killers" is confined to a very few countries, sharing of this information with others assumes great significance. ISRO has greatly benefited from the data laboriously collected, catalogued, and maintained by the United States and the Russian Federation. By developing appropriate analysis tools, ISRO uses this data on an operational basis to avoid collisions with operational spacecraft or during the launch of a satellite launch vehicle.

I would particularly like to mention one example wherein ISRO was alerted a few years ago by Ukraine about the possibility of a non-functional satellite *KUOPON* coming dangerously close (around 2 km) to the Indian spacecraft *INSAT-2DT*. ISRO requested a confirmation from NASA, which was quickly provided. This instance of close cooperation not only enabled the continuity of operational services, but also averted the creation of possibly a large cloud of debris that could have endangered the health of many operating satellites in the vicinity.

This is not the only instance of this kind. On a more collective basis, the successful conclusion of nearly a 15-year effort by around a dozen space agencies under the Inter-Agency Space Debris Coordination Committee culminating in the adoption of the Space Debris Mitigation

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[9] See the International Charter on "Space and Major Disasters" (http://www.disasterscharter.org); the UN-based initiative called SPIDER (Space-based Information for Disaster Management and Emergency Response) [UN General Assembly Resolution A/RES/61/110 dated 15 January 2007, available at http://www.unoosa.org/pdf/gares/ARES_61_101E.pdf]; and the Japan-inspired initiative "Sentinel Asia" under the banner of the Asia-Pacific Regional Space Agency Forum. These are but a few golden examples of collective approaches to enhance global human security.

Guidelines[10] by the UN COPUOS marks a milestone. This notable achievement includes "voluntary implementation through national mechanisms" and, most importantly, a successful practical demonstration of a cooperative approach to solving emerging problems. This experience could certainly serve as a template for the development of other rule- or guideline-based approaches towards orderly and predictable conduct in space.[11]

Outer space is assuredly more secure today than before due to this initiative. The recent U.S. space policy[12] recognizing the risks posed by orbital debris, seeking to minimize its creation, and promising to cooperate in the exchange of information on debris research and the identification of improved debris mitigation practices is another development that raises hope that the future of "collective action" is not as dark as it might appear.

THREAT OF AN ASTEROID STRIKE AGAINST THE EARTH

Another fine example of collective action in the making is the U.S.-led initiative to mitigate the impending danger of an asteroid strike against the Earth.[13] Sharing of expertise, observational data, and scientific analysis to harmonize and develop a common understanding of the problem and a menu of possible solutions is taking place today among the major space-faring nations. The UN COPUOS has taken note of these developments, and discussions have begun in its Science and Technology Subcommittee,[14] raising hopes towards a commonly agreed approach should a need arise.

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[10] "Space Debris Mitigation Guidelines of the Scientific & Technical Subcommittee of the Committee of the Peaceful Uses of Outer Space" Annex IV to the "Report of the Scientific & Technical Subcommittee on its Forty-Fourth session, held in Vienna from 12 to 23 February 2007. A/AC.105/890.

[11] For a detailed account of the history, the efforts of UN COPUOS, the issues, the conflicting views between the developed and developing nations, and the Indian position as space-faring nation and a developing country, see M.Y.S. Prasad, "Technical and Legal Issues Surrounding Space Debris – India's Position in the UN," *Space Policy* 21(2005).

[12] The U.S. National Space Policy was signed on August 31, 2006 (see: http://www.ostp.gov/html/US%20National%20Space%20Policy.pdf).

[13] Jet Propulsion Laboratory, NASA, Near Earth Object Program (see: http://neo.jpl.nasa.gov).

[14] See "Report of the Scientific & Technical Subcommittee on its Forty-Fourth Session," held in Vienna from February 12 to 23, 2007 (COPUOS document A/AC.105/890).

GLOBAL EXPLORATION STRATEGY

The NASA-led initiative of bringing together 14 space agencies[15] in developing a common vision for space exploration is an effort that offers the promise of bringing all major players in space together. The first tangible outcome of this effort, a "Global Exploration Strategy: The Framework Document," was released on May 31, 2007.[16] Innovation in approaches, open mindedness, and a willingness to learn from past experiences are imperatives for this initiative to succeed. A more important question from the collective security viewpoint is whether these participating space-faring nations will be able to see beyond their own self-interest and address the concerns of emerging space nations and, in fact, those of all of humanity.

ELEMENTS OF THE INDIAN SPACE SECURITY ARCHITECTURE

In the author's opinion, the following five elements constitute the crucial parts of a firm and sustainable Indian space security fabric, not all of which are traditionally considered elements of a security architecture.

SELF-RELIANCE

The denial of access to space need not begin or originate in space. It could happen right on the ground and far before a launch could be conceived. Some developing countries are facing it day-in and day-out. Self-reliance is an instrument to develop national technological capability and space systems against the whims of foreign controls. Not commonly perceived in the early stages of space exploration, the risk of foreign denial is overwhelmingly present today and encompasses almost all aspects of space activity, presenting an intentional threat against developing capability for access to and use of space for peaceful purposes. It is also against the spirit of international cooperation embedded in the Outer Space Treaty.

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[15] The space agencies of Australia, Canada, China, France, Germany, India, Italy, Japan, the Republic of Korea, the Russian Federation, the United Kingdom, Ukraine, and the United States participated in this effort in addition to the European Space Agency, making a total of 14 agencies.

[16] The Global Exploration Strategy can be found at: http://www.scitech.ac.uk/Resources/PDF/gesframework.pdf.

The early Indian choice of the indigenous route for the space technology was a firm step towards securing access to space and gaining freedom from foreign compulsions and maneuvers. This view of export-control—which can be seen as denial of access to and use of space—is gaining prominence, and various approaches to combat it have been advocated and experimented with by many nations. Canadian efforts to secure its access to space on its own independent terms and resulting successes have been well documented.[17] In 1999, for example, MacDonald Dettwiler and Associates had to switch to Alenia Aerospazio to construct a satellite bus for *Radarsat-2* to accomplish its national flagship Earth observation mission. More recently, Telesat Canada not only procured its communication satellite *Anik F1R* from outside the United States, but also worked closely with the satellite manufacturer EADS Astrium to ensure independence from "export-controlled" components. Many more nations are finding ways to ensure their access to and use of space on their own terms, free of foreign restrictions. Thus, self-reliance is slowly gaining prominence as a crucial component of the space security architecture of emerging space-faring nations.

A SUSTAINED AND UNFLINCHING SUPPORT BASE

Sustained support of the society for its national space policy and programs is a prerequisite for meaningful long-term security in space. In contrast, the fragility of or the narrowness of public support for the space activities and their guiding policies might shake the very foundations of its security architecture. Just to exaggerate the point, consider a state which announces an aggressive space security initiative under one political leadership without much support from the society and starts implementing it. Since the implementation of such elaborate systems are very expensive, laborious and time-consuming, its success requires sustained support and commitments from successive governments, which may not ensue if the support is fragile and narrow. Such an initiative heightens tension and animosity with the rivals, but unimplemented or half hearted implementation of security architecture may lead to the state being perhaps less secure than before.

By targeting the society as the primary beneficiary of the space activities, India has methodically cultivated wide acceptance of its space program among the various sectors of the society – policymakers,

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[17] Eric Choi and Sorin Niculescu, "The Impact of US Export Controls on the Canadian Space Industry," *Space Policy* 22 (2006).

lawmakers (cutting across the party lines), media, academia, industry and public. Through careful management of its space program, optimal usage of resources, exploitation of the strength of its human capital, and appropriate configuration of priorities, India has been very successful in capping the cost of space systems and space operations. Capacity building through a well cultivated mutually beneficial interaction with academia and the industry has not only instilled robustness into the program but also furthered India's national security interests.

Though not from security viewpoint, the necessity of building and maintaining the constituency for long term space exploration is reported elsewhere[18]. The negative consequences of a weak and lean constituency is far greater in the security domain, wherein peer-responses are triggered through security policy formulation and waning public support weakens faithful and robust implementation as well as its renewal and sustenance.

INTERNATIONAL COOPERATION— AN INSTRUMENTALITY FOR SECURITY ENHANCEMENTS

Engagement in cooperative activities builds common interests resulting in enhanced security. India recognizes the importance of international cooperation as a crucial apparatus in enhancing national, regional and global security and utilizes this tool effectively. As described before, by collaborating with other space faring nations on the basis of equality and reciprocity for enhancing our scientific knowledge of our planet Earth and of the universe and by sharing this knowledge and experience towards capacity building in less space-capable nations, promotion of "access to and use of space for peaceful purposes for one and all" is implemented.

THE RULE OF LAW

The Indian view of the rule of law and its continued evolution and development is aptly described below in an official 2006 statement:

> The Indian Delegation considers that the development of Space Law is crucial to the orderly and organised exploration of space for peaceful purposes (…). We reaffirm that the five UN Space treaties—evolved through

[18] Peggy Finarelli and Ian Pryke, "Building and Maintaining the Constituency for Long Term Space Exploration," *Space Policy* 23 (2007).

> consensus and accepted by a large number of countries—constitute the cornerstones of international space law.
>
> We would like to reiterate the Indian commitment to the use of Outer Space for peaceful purposes in the common interests of mankind. We support development and continuous evolution of the rule of law for the peaceful use and exploration of Outer Space so as to ensure benefits to all countries, in particular to the developing countries.
>
> The Indian Delegation urges all countries to respect the sovereign right of every country to have access to Space and the opportunity to utilize Space for developmental programmes. The respect for safety and security of Space assets and capabilities of all countries, without any denial or threat of denial of access to Space, is inevitably necessity for all of us to preserve and prosper together.[19]

India participates actively in international institutions in the shaping of international views and consensus. Thus, by positing faith in the rule of law and by implementing international instruments in both letter and spirit, India strengthens national, regional, and global security.

SECURITY COMMITMENTS

India recognizes the vitality of space systems, ground segments, and the supporting link for the civil, commercial, and other peaceful uses of Outer Space. Space has been determined to be a crucial component of India's critical national infrastructure. The protection of these systems and their unhindered, uninterrupted, and continual operation, as well as the continued expansion of services derived from these assets is its prime commitment towards its own people and all of humanity.

TROUBLESOME TRENDS

Although born out of the Cold War, it would not be too erroneous to recall the early period of space activity as a "golden era," during which a

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[19] This statement was made by the Indian delegation to the 45th Legal Subcommittee of the UN COPUOS on April 4, 2006, under the agenda item 5 "General Exchange of Views."

number of landmark "rule-based measures" were agreed upon. The sentiments at the very start of that era are reflected in a letter from U.S. President Dwight D. Eisenhower to Soviet Premier Nikolai Bulganin on January 13, 1958:

> I propose that we agree that Outer Space should be used only for peaceful purposes. We face a decisive moment in history in relation to this matter. Both the Soviet Union and the United States are now using Outer Space for the testing of missiles designed for military purposes. The time to stop is now.[20]

This position was by mid-1958 reflected in U.S. domestic law.[21]

The 1963 signing by the United States and the Soviet Union of the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water, commonly known as PTBT[22] (Partial Test Ban Treaty), which prohibits, apart from underground tests, nuclear testing and explosions in outer space, prompted the United Nations in October of that year to call upon all states to follow the same approach.[23] The Outer Space Treaty in 1967 declared outer space a "province of mankind" and mandated

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[20] U.S. Department of State, "Documents on Disarmament 1945-1959," 1995, p. 41.

[21] The National Aeronautics and Space Administration Act was signed on July 29, 1958. It contains the point: "The Congress hereby declares that it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all mankind." [Section 102(a), NASA Act, House Resolution, H.R. 12575, Public Law 86-568, 85th Congress, First Session, July 29, 1958, p. 5.

[22] Website of the Center for Nonproliferation Studies, Monterey Institute of International Studies, at: http://cns.miis.edu.

[23] The UN General Assembly unanimously adopted resolution 1884 on October 17, 1963, under the caption "General and Complete Disarmament" which welcomed the expressions by USSR and USA of their intentions not to station in the Outer Space any objects carrying nuclear weapons or other kinds of weapons of mass destruction and solemnly called upon all states to "(a) refrain from placing in orbit around the earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, installing such weapons on celestial bodies, or stationing such weapons in outer space in any other manner, and (b) refrain from causing, encouraging or in any way participating in the conduct of the foregoing activities." See http://daccessdds.un.org/doc/RESOLUTION/GEN/NRo/185/59/IMG/NR018559.pdf?OpenElement.

its use for "peaceful purposes," manifesting human confidence in the rule of law and a collective approach to global security. The subsequent formulations of additional space treaties and their entry into force further strengthened this faith.

The 21st century, on the contrary, has begun with many developments, particularly in U.S. policy, which do not augur well in terms of global space security.

1. The U.S. withdrawal from the Anti-Ballistic Missile (ABM) treaty[24] in 2002 eliminated a long-standing U.S.-Russian prohibition on space-based missile defense systems, stimulating renewed concerns about the potential negative implications of space's weaponization. Further, this step extended tacit support to an already blossoming litany of U.S. military doctrines advocating "space dominance" and "space control." The U.S. Space Command's "Vision for 2020," which called for "full-spectrum dominance" and described the medium of space as a fourth area of warfare (after the land, sea, and air), is another such example.[25] Linking and equating "freedom of action in space" with "air power and sea power" is an unambiguous invitation to an arms race in space.

Accordingly, at the UN First Committee on October 25, 2005, for the first time in the history of the resolution on the prevention of an arms race in Outer Space (PAROS), the United States voted against this resolution rather than abstaining from the vote.

Similarly, the U.S. policy of "negation," which advocates active denial of the use of space to any other nation if its actions are perceived as hostile to U.S. national interests threatens to demolish the basic legal fabric of space security itself.

Still more worrisome is the official U.S. declaration of its opposition to the development of new legal regimes (part of its 2006 National Space Policy), given that the continuous development of space technology, science, and applications requires matching legal responses to adjust the existing space regime and develop new measures. Unilaterally foreclosing any debate on such an important matter not only heightens mistrust but also impedes the orderly development of space activities.

In addition to these developments in the United States, there is the 2007 Chinese test of a ground based anti-satellite weapon, which created a

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[24] In December 2001, the U.S. government announced its decision to withdraw from the ABM treaty, which took effect in June 2002.

[25] See the website of the Federation of American Scientists, at: http://www.fas.org/spp/military/docops/usspac.

large cloud of debris[26] that now poses a serious threat to existing operational satellites.

These developments constitute a potentially volatile mix, which has the potential to irreparably damage the very foundations of space security. The present decline international trust in rule-based approaches to global space security, compared to earlier era of lofty ideals, marks a rapidly deteriorating space security landscape.

THE ASAT TEST AND PAROS

The Chinese ASAT test has caught the attention of policy analysts the world over. Some attribute it to national pride, some to an attempt at space dominance, and yet others to China seeking closer parity with other space powers. Others view this from the lens of the Sino-US conflict over Taiwan. Still others believe it to be a mechanism to bring all relevant players to the negotiating table for crafting a legally binding instrument preventing the weaponization of space.

Let us examine the following pairs of events:

- The U.S. withdrawal from ABM treaty is announced in November 2001 and takes effect in June 2002. On June 28, 2002, Russia and China submit a joint paper called "Possible Elements for a Future International Legal Instrument on the Prevention of Deployment of Weapons in Outer Space, [and] the Threat or Use of Force against Outer Space Objects."[27]
- On October 25, 2005, the United States voted against PAROS in the First Committee of the UN. China had dazzled a U.S. reconnaissance spacecraft in September of that year.[28]
- The United States published its aggressive and provocative new National Space Policy in October 2006. On January 11, 2007, an ASAT test is conducted by China.

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[26] On January 11, 2007, China tested an anti-satellite (ASAT) weapon against a defunct Chinese weather satellite called *Feng Yun 1-C* weighing around 750 kg and orbiting roughly at 850 km. It has been estimated that this incidence has enhanced the population of space debris by around 10 percent. See http://www.uscusa.org/global_security/space_weapons/debris-from-chinas-asat-test.html.

[27] SpaceSecurity.org, "Space Security 2003," p. 58.

[28] Editorial, *Aviation Week and Space Technology*, January 29, 2007, p. 74.

Is the close correlation between these various events merely coincidental? Or is there a pattern?

Undeniably, the U.S. position that there is no arms race in space and therefore that there is no need for a discussion on PAROS is no longer tenable. Hopefully, a healthy debate will ensue, resulting in an international consensus on keeping outer space free of weapons. It is unfortunate, though, that the noble intentions of non-weaponization of space are compelled to move forward on the shoulders of violence.

CONCLUSION

What should the global response be to these recent and troublesome trends? Should other states follow the footsteps of China to demonstrate the obvious, that there is already an arms race in space and thus establish the need for PAROS? Despite past rejections of the opportunity to hammer out a space non-weaponization treaty collectively, let us not permit space conditions to develop wherein military compulsions prevail over good sense, thus endangering the very existence of humankind.

Out of many possibilities reported in the literature, a treaty, being legally binding, offers the attraction of a long-lasting solution.[29] But, for the very same reason, its content and scope may get restricted by the dynamics of negotiation to a bare minimum that is acceptable to everyone. Moreover, crafting a treaty is very laborious, expensive, and time consuming. Nevertheless, its legally binding character makes it the inevitable long- term goal for collective security in space.

A "code of conduct" might fill in the gap until a treaty is formulated, negotiated, and enters into force. By encompassing all those desirable elements that were acceptable to a majority and yet could not immediately find a place in the negotiated instrument, due to stubborn opposition of a few, a code of conduct can play a useful role. Such codes, if practiced widely by states, hold the promise of turning into international law through a "customary" approach.[30] The recent acceptance of the Space

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[29] There have been instances in the past, however, wherein a state has announced its withdrawal from a treaty even after its ratification. Withdrawal of the United States from the ABM treaty is one such example.

[30] Bin Cheng. "United Nations Resolutions on Outer Space: 'Instant' International Customary Law?" *Indian Journal of International Law* 5 (1965); also, G. M. Goh, "Keeping the Peace in Outer Space: a Legal Framework for the Prohibition of the Use of Force," *Space Policy* 20 (2004).

Debris Mitigation Guidelines by the international community offers this hope and could serve as a template.

While all these approaches have strengths and weaknesses, and one could debate their relative merits and demerits, there can be no alternative to a "collective" or "international" approach to space security. The Outer Space Treaty of 1967 leaves no room for unilateralism of any kind. Among the various routes discussed and analyzed in the literature, it appears that any one of them may not serve all the needs and a "judicious menu" of possibilities may be a better option.

Outer space is the next frontier. Together, let us make it beneficial for all of humanity.

JAPANESE PERSPECTIVES ON SPACE SECURITY

Setsuko Aoki

The purpose of this paper is to examine and propose certain measures to enhance Asian space security from the perspective of international law. In the first section, the current Asian situation in space security is considered. Emphasis is placed upon the Asian reactions toward the recently conducted Chinese anti-satellite (ASAT) test and the established rules of international space law. International law should be the firm basis of the reactions by individual states to any event that might jeopardize regional space security. In the second section, Japanese space policy and law on the peaceful uses of outer space are briefly touched upon, primarily for two reasons. First, enacting a new Japanese law regarding space may shortly reverse Japan's long-time policy restricting uses of space. Such a movement is worth mentioning in this context. Second, such a policy change might enable Japan to participate in a new undertaking, such as collective satellite monitoring for security purposes, which could promote general regional security and not be limited only to space affairs.

The author believes that the change of Japan's interpretation of the peaceful uses of outer space could be most useful in stabilizing Asian space security, and that it is not likely to become a destabilizing element for the region. The third section of this paper is reserved for proposals that promote regional collective security in space.

Within this paper, the term "Asia" refers to the northeastern and southeastern parts of Asia, or "ASEAN + 3"[1] plus Mongolia, the Democratic People's Republic of Korea (DPRK or North Korea), as well as South Asian countries such as India, Pakistan, and Sri Lanka. On the other hand, countries such as Iran, Iraq, and the former Soviet countries are excluded from the discussion of Asian nations, unless otherwise specified.

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[1] The Association of South East Asian Nations (ASEAN) was first established in 1967 by Indonesia, Malaysia, Philippines, Singapore, and Thailand. Brunei became a party in 1984; and the members accepted after the end of the Cold War are Cambodia, Laos, Myanmar, and Vietnam. "ASEAN +3" consists of the "ASEAN 10" nations plus China, Japan, and the Republic of Korea (South Korea).

Russia is also excluded, although some parts of Russia are geographically located in Asia.

ASIAN SPACE SECURITY FROM AN INTERNATIONAL LAW PERSPECTIVE

THE CHINESE ASAT TEST: A VIOLATION OF INTERNATIONAL LAW?

On January 12, 2007 (local time), China successfully performed an ASAT weapons test at an altitude of 865 km (500 miles), destroying its own weather satellite target (*FY-1C*) with a kinetic-kill vehicle (KKV) on board a medium-range ballistic missile launched from the Xichang space center.[2] The success of this test demonstrated Beijing's new space capability and established China as the third nation in the world to destroy a satellite in outer space, after the USSR and the United States. China is also the third country to launch a human being into space. When its first manned spaceship, *Shenzhou 5*, successfully returned to Chinese soil in October 2003, it was widely covered by the world media as a great accomplishment of the Chinese space program. However, the ASAT test attracted a different type of media coverage, and serious concerns were voiced by the international community.

It is necessary to note that some of these concerns have been expressed in the context of the test's generation of thousands of pieces of space debris, which could jeopardize near-Earth satellites, such as telecommunications, broadcasting, meteorological, and remote-sensing satellites that modern global civilization relies upon. In most cases, the criticism of the ASAT test itself was made not as a violation of a specific rule of international law, but for contravening its basic spirit. One example would be the statement made by the delegation of the European Union (EU) at the plenary meeting of the newly opened session of the Conference on Disarmament (CD) held in Geneva. The EU delegation referred to the recent Chinese ASAT test, without naming China, as follows:

> The EU is very concerned about a recent test of an anti-satellite weapon. Such a test is inconsistent with international efforts to avert an arms race in outer space. In this context the EU calls upon all signatory States to the

[2] See, e.g., Craig Covault, "Chinese Test Anti- Satellite Weapon," http://www.aviationweek.com/aw/generic/story_channel.jsp?channel=space&id=news/CHI01177.xmlstory_channel.jsp?channel=space&id=news/CHI01177.xml (last accessed on July 10, 2007).

> Outer Space Treaty to abide by their commitment to exercise their space activities in accordance with international law and in the interests of maintaining international peace and security.[3]

On the same day, as Japan and South Korea made their general statements, neither nation referred to the ASAT test, although it could deeply affect the regional space security balance they face.[4] The Japanese and South Korean silence might have been due to their reflection that the legally binding rule of international space law falls short of prohibiting an ASAT test in outer space. Later, on February 13, the Japanese delegation expressed its concern in relation to the Chinese ASAT test and stated that Japan had sought an explanation from the Chinese government about the facts and intentions of its actions.[5]

At the February 2007 meeting of the Science and Technical Subcommittee (STSC) of the Committee on the Peaceful Uses of Outer Space (COPUOS), Canada, the Czech Republic, France, Germany, Japan, and the United States expressed concerns about the Chinese ASAT test. They viewed it as threatening to the safety and peaceful uses of outer space.[6] Nine delegations expressed their concerns in terms of its production of a large amount of orbital debris. This group consisted of Australia, Canada, the Czech Republic, France, Germany, Italy, Japan, South Korea, and the United States, among which Canada and South Korea did not mention the name China specifically.[7] China responded by stating that the January 12 test did not constitute a threat to any country, that it has been a firm supporter of the peaceful uses of outer space and a leading country to promote the prevention of an arms race in outer space, and that the United States had accounted for more than 40 percent of all space debris up until the 2007 ASAT test.[8]

During the plenary meeting of COPUOS held in June 2007, four nations referred to the Chinese ASAT test as a danger to manned space

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[3] The German Presidency of the European Union, EU Statement at 1048 Plenary Mtg., of the CD (January 24, 2007), p. 2.

[4] Statements of Japan and Korea at 1048 Plenary Mtg. of the CD (January 24, 2007).

[5] CD/PV 1052 (February 13, 2007), p. 26.

[6] Statements of agenda item 3 (general exchange of views) of the STSC of the COPUOS, 2007.

[7] Statements of agenda item 7 (space debris) of the STSC of the COPUOS, 2007.

[8] Unedited transcripts of the 2007 COPUOS meetings would be shortly on the site of the UN Office for Outer Space Affairs (http://www.unoosa.org/oosa/index.html).

activities and other space programs. Those four nations were Canada, Japan, the United Kingdom, and the United States.[9]

The characteristics of the international reactions to the Chinese ASAT test can be summarized as follows: although grave concerns have been expressed in the world media, the number of nations that expressly criticized the ASAT test itself was rather limited. Additionally, such criticism was often linked to the test's adverse effect on international efforts to avert an arms race in outer space and to protecting and preserving the space environment. Moreover, Asian reactions with the exception of Japan and South Korea, were conspicuously lukewarm.

Thirteen of the 65 CD members are Asian nations: Bangladesh, China, the DPRK, India, Indonesia, Japan, Malaysia, Mongolia, Myanmar, Pakistan, the Republic of Korea, Sri Lanka, and Vietnam. Also, among the 67 members of COPUOS, 11 are Asian nations: China, India, Indonesia, Japan, Malaysia, Mongolia, Pakistan, Philippines, the Republic of Korea, Thailand, and Vietnam. Of the Asian members at the CD or COPUOS, only Japan and South Korea have showed concerns about the ASAT test. How should such a situation be interpreted in terms of collective space security in Asia? It seems that underlying indifference or resignation about collective space security in Asia, along with the fundamental lack of a cooperative regional framework for space activities (or for security in general) contributes to the tepid Asian reactions toward China's ASAT test.

THE ASAT TEST AND INTERNATIONAL ENVIRONMENTAL LAW

While the Chinese test was not prohibited by the arms control provisions of a specific treaty or by customary international law, the USSR and United States, by their tacit understanding, decided to halt the actual destruction of the targets in outer space in 1986 after completing a combined 21 ASAT tests since 1968. It was realized that ASAT tests were adversely affecting the environment of outer space and were destabilizing the relationship between the two superpowers. During the two decades when no intentional destruction of a satellite occurred, international environmental law was advanced to the extent that rules of customary international law have been crystallized after the Declaration of the UN Conference on the Human Environment in 1972. Principle 21 of that Declaration, stipulating that the states have the "responsibility to ensure

[9] Such statements were made in agenda item 4 (general exchange of views). In agenda item 7 (report of the STSC of the 44th session), Japan and the United States referred to the ASAT test in conjunction with the adoption of the space debris mitigation guidelines.

that activities within their jurisdiction or control do not cause damage to the environment of other States or areas beyond the limits of national jurisdiction," is now universally regarded as a customary international law rule, and, as such, may be applied to the Chinese ASAT test that was carried out in outer space where no country could claim the sovereignty. It is now maintained as an environmental issue that states are under the obligation to avoid generating space debris as much as possible. Shared knowledge and concerns about the danger of space debris for the civil use of outer space has resulted in the adoption of space debris mitigation guidelines by the Inter-Agency Space Debris Coordination Committee (IADC)[10] and the STSC of COPUOS.[11] The latter guidelines were transmitted to COPUOS in June 2007 and also adopted unanimously.[12] In December 2007, the space debris mitigation guidelines were adopted by the UN General Assembly (UN GA), thus adding a new UN GA resolution on space activities.[13]

While the measures reflected in the COPUOS space debris mitigation guidelines are not legally binding and are merely recommendations to the 67 member states, the obligation not to cause damage to the environment of areas beyond the limits of national jurisdiction is understood as a rule of customary international law. If the belief were widely shared that the potential danger caused by an intentional generation of space debris was a violation of such a customary international rule, then it might have been easier for smaller Asian nations to criticize China's conduct. That rule does not have to be included in the field of arms control (space security), but could be found as a rule related to the safety use of outer space (space safety). In a field where the notion of collective space security itself is not established, the cooperative measures on space safety (based on international law) may function as a proxy to promote security. Based on this assumption, the possibility of enhancing space security in Asia through space *safety* measures will be explored in a later section of this paper.

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[10] Ten national space agencies and the European Space Agency (ESA) belong to the IADC, which was established in 1993. The space agencies of China, India, and Japan are participants of the IADC as Asian members.

[11] UNGA A/AC.105/890 (March 6, 2007), para. 99 and Annex IV.

[12] See, e.g., Annex, A/62/20 (2007).

[13] It is possible that the Chinese ASAT test in the previous month accelerated the process of the STSC of COPUOS adopting the space debris mitigation guidelines that had already been negotiated for several years. However, it is at the same time safe to say that sooner or later, the guidelines would have been adopted as non-binding, soft law instruments.

TERMINOLOGY: "SPACE SECURITY" AND "SPACE SAFETY"

While a variety of definitions can be found with respect to "space security," it seems that most of them contain the direction and desirability of a weapons-free outer space and measures for the prevention of an arms race in outer space (PAROS). "Space weapons," or activities that can be defined as the "weaponization of outer space" are, accordingly, most closely related to issues of space security. One of the most frequently used definitions of "space security" reads as follows: "the secure and sustainable access to and use of space, and freedom from space-based threats."[14]

"Space safety" is a concept similar to space security, but the focus is placed on the measures to accomplish safer conduct in space activities by various methods: the development of space technology, space debris mitigation measures, effective regulatory coordination concerning frequencies and orbital slots, the notion of a world-wide pre-launch notification system, and a complete and comprehensive registration system on space objects in order to avoid interference with other space objects. This concept was created because increasing civil, commercial, and military uses of outer space have necessitated a safer environment for space activities.

One of the influential concepts of "space safety" has been enunciated in various proposals for space traffic management (STM), a well-known phrase within the space community since around 2000. One dominant definition of STM is "the set of technical and regulatory provisions for promoting safe access into outer space, operations in outer space and return from outer space to Earth free from physical or radio-frequency interference." The tendency of some countries to highlight the importance of STM at various international fora may be based on the judgment that "space safety" could be a realistic goal, one not requiring any arms control provisions in addition to present international treaties.

If the CD, established as the single multilateral arms control negotiating forum, has failed to produce a positive consensus on space security,[15] that outcome cannot be expected to take place in the Asian

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[14] This is the definition used by the Canadian government, e.g., at the STSC of the COPUOS in February 2007, and also used by a research consortium named Spacesecurity.org, consisting of arms control NGOs and Canadian universities, including the Institute of Air and Space Law at McGill University.

[15] Intensive examination and discussion at the CD and PAROS *ad hoc* committee at the CD (1985-94) failed to reach any consensus at all on issues ranging from the definitions of "space weapons," the "weaponization of outer space," and "ASAT weapon," to questions related to the adoption of a treaty or any other legal instrument with respect to arms control

region, where the post-Cold War era has not yet begun. Thus, closer regional cooperation in terms of the safety aspects of international space law (environmental protection included) could be a candidate for the first step. In order to consider such a possibility, the degree of applicability of current international space law to the Asian region is discussed in the next section.

ASIAN NATIONS AND INTERNATIONAL SPACE LAW

International law has made considerable efforts and important contributions to the provision and maintenance of space security and safety. In this section, the current situation of such international legal controls in the Asian region is examined in some detail. For that purpose, applicable treaties include the five UN treaties on space, the other arms control treaties that include space-related elements, and the laws of armed conflict affecting the possible outbreak of space warfare. Asian views on the applicability of such categories of treaties are analyzed below.

ASIAN STATES AND THE UN SPACE TREATIES

International treaties on space activities of a universal nature have been negotiated and adopted at COPUOS. However, the norm of consensus-based adoption of treaties has considerably restricted their number, particularly as the number of member-states has steadily increased. Thus, the fifth treaty, the Moon Agreement of 1979, is the last adopted by COPUOS. Among the other four treaties are the so-called the Magna Carta of space, the Outer Space Treaty (1967)[16] (OST), the Rescue Agreement (1968),[17] the Liability Convention (1972),[18] and the

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in outer space. Currently, the possibility seems low to re-establish the PAROS *ad hoc* committee at the CD. Likewise, the mandate of COPUOS does not include examining or negotiating the limitation of military use of outer space or demarcation of peaceful and non-peaceful uses of outer space, which is solely reserved for the CD.

[16] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (entered into force on October 10, 1967) 610 U.N.T.S.205.

[17] Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (entered in to force on December 3, 1968) 672 U.N.T.S. 119.

[18] Convention on International Liability for Damage Caused by Space Objects (entered into force on September 1, 1972) 961 U.N.T.S. 187.

Registration Convention (1975).[19] Among these five UN space treaties, the Moon Agreement needs to be carefully examined, since after more than 20 years of its entry into force, it has been ratified or acceded to by only 13 countries, none of which are leading space-faring nations. The primary reasons for this absence are provisions that treat the Moon[20] and its natural resources as the "common heritage of mankind," thereby limiting free commercial exploitation.[21] However, approximately one new state per year ratifies the treaty, a possible indication of renewed interest in this agreement. These have included Belgium (2004), Peru (2005), and Lebanon (2006). New enthusiasm for Moon exploration by space-faring nations[22] and the possible exploitation of its natural resources, as China has openly expressed to its domestic media,[23] may provoke concerns from developing countries, resulting in an increasing accession to the Moon Agreement. Currently, only the Philippines and Pakistan have ratified the Moon Agreement among Asian states, and, therefore, the space security implications of the Moon Agreement are still limited from a regional perspective.

Among Asian nations, only Pakistan is party to all five UN treaties. China, India, Indonesia, Japan, South Korea, and Mongolia are parties to four treaties (except the Moon Agreement); this is standard for the behavior of the space-faring nations of the world.[24] Laos and Singapore are parties to the first three treaties, and Nepal and Thailand, the first two. Sri Lanka is the party to the OST and the Liability Convention, while the Maldives is only party to the Rescue Agreement. Myanmar and Vietnam are parties to the OST. Brunei Darussalam, Cambodia, the DPRK, and Malaysia are not parties to any of the UN space treaties.

In the space security implications, it is the OST that is of supreme importance, and thus, it is important to note that Brunei Darussalam, Cambodia, the DPRK, Malaysia, the Maldives, and the Philippines are not

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[19] Convention on Registration of Objects Launched into Outer Space (entered into force on September 15, 1976) 1023 U.N.T.S. 15.

[20] For the purpose of the agreement, the "Moon" means all the celestial bodies within the solar system including the Earth, which orbits around or engage in other trajectories with regard to the "Moon." See Article 1 (1) & (2) of the Moon Agreement.

[21] Article 11 (1)-(8)) of the Moon Agreement.

[22] China, European Space Agency (ESA), India, Japan, and the United States have their own program with the possibility of multilateral cooperation. Russia is also considering a concrete project.

[23] See: http://www.news24.jp/87716.html (broadcast on July 7, 2007).

[24] For instance, the United States, Russia, France, Germany, Italy, and the United Kingdom have ratified or acceded to these four UN treaties.

parties to the OST, and accordingly, not subject to the arms control provisions provided for in the OST. Among non-parties to the OST, since Malaysia is a country possessing a certain space capability, concerns have been expressed about its non-party status to the *sui generis* space law regime. Because Malaysia has been operating multiple telecommunications and broadcasting satellites (*Measat 1* to *3*) and a remote sensing micro-satellite (*TinungSat-1*, 50 kg),[25] but also training national astronauts in Russia for missions on board the *International Space Station* (*ISS*), special agreements have been negotiated between Malaysia and the related *ISS* partners to guarantee Malaysia's observance of the UN space law regime.

SPACE SECURITY PROVISIONS OF THE UN SPACE TREATIES

Article IV of the OST and Article III of the Moon Agreement directly stipulate arms control provisions affecting outer space. Articles I, IX, X, and XI of the OST are provisions indirectly relevant to space arms control. The first paragraph of Article IV stipulates that states party to the OST:

> undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner.

The second paragraph of Article IV requires the Moon and other celestial bodies to be used for "exclusively for peaceful purposes." Concrete acts expressly prohibited include: "The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies…." It can be safely said, accordingly, that no essentially military activities are to be conducted on the celestial bodies. But military personnel engaging in scientific research or any other activity for peaceful purposes are not prohibited.

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[25] A/AC.105/INF.406 (January 24, 2002), p.3. ST/SG/SER.E/478 (August 22, 2005) provided that news that *TinungSaT-1* was not in operation any more. Currently, another remote-sensing micro-satellite program (the Razaksat program) has been pursued with the cooperation of a Korean private company, SATREC-I.

The Moon Agreement extends the "exclusively for peaceful purposes" conditions to the whole of outer space, not restricted to the celestial bodies.[26] Article 3 (2) of the Agreement provides that:

> Any threat or use of force or any other hostile act or threat of hostile act on the Moon is prohibited. It is likewise prohibited to use the Moon in order to commit any such act or to engage in any such threat in relation to the Earth, the Moon, spacecraft, the personnel of spacecraft or man-made space objects.

It is sometimes pointed out that this provision has strengthened space arms regulations beyond the OST. However, taking note of the fact that the UN Charter already orders member states to "refrain in their international relations from the threat or use of force,"[27] it may be maintained that no new restrictions are added by Article 3 (2) of the Moon Agreement. However, provision 4 of Article 3 might lead to a more controversial interpretation. It prohibits "[t]he establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on the Moon." If "on the Moon" could be interpreted as on the celestial bodies and in orbit around (or other trajectories to or around) the celestial bodies within the solar system,[28] the scope of the prohibition of the weapons test could be extended to the whole of the solar system. But, since this depends upon how "on the Moon" is defined, a more thorough examination is required to determine if the testing of ASAT weapons could be banned among the member states of the Moon Agreement.

SPACE SAFETY PROVISIONS OF THE UN SPACE TREATIES

The first sentence of Article IX of the OST stipulates the fundamental obligation of a state party to proceed with space activities with due regard to the corresponding rights of the space activities of other states parties, as guided by the principle of cooperation and mutual assistance. The third sentence of Article IX provides the obligation of prior consultation by any state party that plans an activity or "experiment" that might cause "potentially harmful interference with the activities of other

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[26] Article 3 (1) of the Moon Agreement.
[27] Article 2 (4) of the United Charter.
[28] See Article 1 (1) & (2) of the Moon Agreement.

States Parties." Likewise, a potentially affected state party may request a consultation concerning the activity or experiment. Thus, it is often claimed by international lawyers that the obligation of space debris mitigation measures can be deduced from this provision.[29] A position could be maintained on the basis of this reasoning that the ASAT experiment of China that took place on January 12, 2007, is a violation of the obligation of prior consultation.

The Chinese ASAT test may also amount to a violation of the agreement among the states parties to inform the secretary–general of the United Nations and the public of "the nature, conduct, locations and results of its activities."[30] However, since this obligation is restricted by the phrase "to the greatest extent feasible and practicable," applying Article XI to legally condemn the ASAT test by China seems difficult. Moreover, in the OST, there are no provisions provided for regarding the procedures of lodging a complaint among the parties. Article X stipulates the possible opportunity of states parties "to observe the flight of space objects launched" by other states in accordance with bilateral or multilateral agreements to be made in the future. That provision has not developed into an international monitoring system. But, based on this provision, transparency and confidence-building measures (TCBM) could be established.

The Rescue Agreement, the Liability Convention, and the Registration Convention play an indispensable role for ensuring the safe use of outer space, especially in the event of an accident. States parties to the OST are internationally responsible for national activities even if the actor is a non-governmental entity.[31] A category of states defined as "launching State(s)" in Article VII of the OST and Article I (c) of the Liability Convention are absolutely liable for damage to the victim state. Victim-oriented compensation completed in a prompt and assured manner is to be enabled by being a Party to the Liability Convention. The Registration Convention provides the obligation of the launching state to register the space object launched into Earth orbit or beyond in a domestic registry and to furnish the necessary information to the UN secretary-general, including: 1) names of launching state(s); 2) an appropriate designator of the space object or its registration number; 3) date and territory or location of launch; 4) basic orbital parameters, including nodal

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[29] See, e.g., Resolution No. 5 of the 66th Conference on the International Law Association held in Buenos Aires (1994). *ILA Report* (1994), p. 334 *et seq.*

[30] Article XI of the OST.

[31] Article VI of the OST.

period, inclination, apogee, and perigee; and 5) general function of the space object.[32] It is often suggested that dutiful registration of space objects in accordance with the Registration Convention could be an effective means to promote TCBM. Thus, more efforts are required to convince Asian states to ratify or accede to the Registration Convention. The Registration Convention, likewise, provides a clue as to how to solve the question of which state shall have jurisdiction and control over a particular space object by, e.g., requiring the "owning" state to register a space object, even if there are several launching states. Assigning space objects a nationality, and thus a legal means to identify jurisdiction for enforcement, is of vital importance to establishing clear implications of harmful behavior in space.

ARMS CONTROL TREATIES AND THE LAWS OF ARMED CONFLICT

Among the arms control treaties not specifically made for the use of outer space, the Partial Test Ban Treaty (PTBT) of 1963 is the most important, since it includes outer space in the area where any nuclear weapons test explosion is forbidden (Article I). Asian nations except Brunei, Cambodia, China, North Korea, Maldives and Mongolia are the parties to the PTBT. One example of related laws of armed conflict would be the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ENMOD Convention) of 1977, which prohibits states parties from engaging in military or any other hostile use of environmental modification techniques in specified areas including outer space.[33] Bangladesh, China, India, Indonesia, Japan, South Korea, Laos, Mongolia, Pakistan, Sri Lanka, and Vietnam are the parties to the ENMOD Convention. If the Chinese ASAT test is perceived as a violation of this convention, parties may lodge a complaint with the UN Security Council.[34] Whether this would be a valid action depends on to the interpretation of the definitions of "environmental modification technique" and "military or any other hostile use."[35] The latter condition might be difficult to meet in case of the China's destruction of its own satellite.

Since an increasing number of civil and commercial satellites are being used during armed conflicts for enhancing the ability to fight on Earth, the identification of a state to hold jurisdiction and/or control of a

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[32] Article II (1) & IV (1) of the Registration Convention.
[33] Article I & II of the ENMOD Convention.
[34] Article V (3) of the ENMOD Convention.
[35] Article I of the ENMOD Convention.

satellite has become a critical issue. It is now directly related to the question of what constitutes a neutral state. A country that is found to be a violator of the laws of armed conflict, especially laws of neutrality, may be the target of a counterattack from the belligerent state.[36]

As a conclusion to this section, the author recommends that more nations in Asia should become contracting parties to the UN space treaties in order to construct a solid base within which regional space security and space safety rules could be better applied. As a first step, all the nations in this region should become parties to the OST. Space safety measures in this treaty, plus the rule of emerging customary international law, could ban the actual destruction of space objects in outer space.

SPACE SECURITY: PERSPECTIVES FROM JAPAN

Recent developments in Japanese space security policy lead to the question of whether Japan's possible policy shift could change the context for regional space security, and, if so, it is to be changed for better or for worse?

"NON-MILITARY USE" IN THE DIET RESOLUTIONS OF 1969

When the law concerning the National Space Development Agency of Japan (NASDA Law) was passed in 1969,[37] Diet Resolutions were also adopted by both Houses unanimously to assure that Japanese space activities would be kept within the limits of "exclusively for peaceful purposes."[38] The interpretation of "exclusively for peaceful purposes" was not necessarily consistent with the definition of "non-military" uses of outer space generally adopted by states parties of the OST. Japan's interpretation was certainly contradicted by state practices since the advent of space exploration and use. It was widely understood in most countries that "all military uses are permitted and lawful as long as they remain 'non-aggressive' as per Article 2(4) of the UN Charter, which prohibits 'the

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[36] See, e.g., USAF, Counterspace Operations: Air Force Doctrine Documents 2-2.1 (2 Aug. 2004). It might be desirable, considering the possibility of military clashes in the Asian region (e.g., over the Taiwan Strait), that analysis of other treaties on the laws of armed conflict (formerly called "laws of war"), especially those of neutrality law, should be undertaken.

[37] Law No. 50 of June 23, 1969.

[38] Diet Resolution by the House of Representatives was adopted on May 9, 1969, and that by the House of Councilors was on June 13, 1969.

threat or use of force'."[39] However, during the drafting process of the NASDA Law and Diet Resolutions, it was repeatedly stated that irrespective of the international standard interpretation of "exclusively for peaceful purposes," in Japan space activities would be strictly "non-military."[40]

This non-military principle caused a series of difficulties for the practical use of space by the Japanese Self-Defense Forces (SDF). One early example was the heated discussion over the lawfulness of the SDF being a user of the *CS-2* telecommunications satellite, which was operated by the public corporation International Telegraph and Telephone Corporation for civil use. The legality was then discussed as to whether the SDF could ask for a budget for UHF equipment to receive radio waves from U.S. military telecommunications satellites (Fleetsat) in planned joint training.[41] In February 1985, to address these circumstances, a unified governmental interpretation was released, which provided that the SDF could be a user of satellites under the following conditions: first, if a certain satellite had already been widely used in the everyday life of Japan's civil society; and second, if the satellite in question had similar functions to those in the first category.[42] Based on this unified view, the SDF was able to acquire remote-sensing images not only from NASDA satellites but also from foreign commercial satellites, such as the French SPOT system. The governmental unified view was also applied to the decision on the introduction of Information-Gathering Satellites (IGS) as a reaction to the test of North Korea's Taepodong-1 ballistic missile on August 31, 1998, which passed over of the northern part of the main island (Honshu) of Japan. In order to abide by the conditions imposed by the Diet Resolutions, a series of IGS have been operated by the Cabinet Satellite Intelligence Center (CSICE) under the Cabinet Intelligence and Research Office (CIRO) of the Cabinet Secretariat, but not by the SDF. Likewise, the resolution of the images of the IGS must not be better than ones available in the commercial marketplace. In addition, early-warning satellites, which would be useful for the identification of the launch of a ballistic missile,

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[39] Ivan A. Vlasic, "The Legal Aspects of Peaceful and Non-Peaceful Uses of Outer Space" in Bupendra Jasani, ed., *Peaceful and Non-Peaceful Uses of Space*, (Taylor & Francis, 1991) p. 40.

[40] See, e.g., Science and Technology Promotion Measures Special Committee, House of Representatives Report, No. 2, May 8, 1969, p. 6.

[41] Budget Committee, House of Representatives Report, No. 4, February 5, 1985, p. 4.

[42] Budget Committee, House of Representatives Report, No. 5, February 6, 1985, p. 3.

cannot be acquired and operated by the SDF, since this kind of satellite is not widely used in civilian life.

THE RATIONALE FOR A NEW BASIC LAW ON SPACE ACTIVITIES

The demarcation of non-military versus military uses of outer space is becoming increasingly blurred as space technology that is inherently dual-use in nature has advanced. At international fora, such as the CD, there is a growing tendency to accept that the militarization of outer space is a lawful activity and even brings a stabilizing effect to international security. Also, Japan's security environment has changed for the worse since the end of the Cold War. Moreover, under such a strict non-military policy, space industrialization in Japan has also faced serious obstacles. For instance, export licenses for Japanese rocket engines or telecommunications satellites may not be granted unless it can be guaranteed that these items would be used only for non-military purposes. The H-IIA rockets that have been transferred to the Mitsubishi Heavy Industries, Ltd., from the Japan Aerospace Exploration Agency (JAXA), may not launch a dual-use satellite such as *Koreasat 5*, Korea's first combined civilian and military satellite. Worse, currently no effective framework exists to establish, regulate, and supervise Japan's space activities, including academic research, space applications, space industrialization, and space uses with possible security implications.[43] In contrast, during the last decade, certain other states in Asia have been steadily constructing legal and institutional frameworks to better develop their national space capabilities. Concerned with this situation, the Liberal Democratic Party (LDP) several years ago started to engage in a study and drafted a bill that addressed such challenges. The New Komeito Party, a partner of the coalition government, soon moved in the same direction. On June 20, 2007, after almost two years of intensive study, the Basic Law on Space Activities bill was submitted to the House of Representatives (the Lower House) by 11 Parliament Members of the coalition party.[44] If the Basic Space Law bill is passed into a law, the restriction on military space activities may be lifted. As far as the security implications are concerned,

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[43] The central government reform of 2001 changed the scope of the mandates of the Space Activities Commission (SAC), a supervisory authority of Japan Aerospace Exploration Agency (since October 2003). Now that JAXA/SAC are under the jurisdiction of the science and technology policy of the Ministry of Education, Culture, Sports, Science and Technology (MEXT), it is almost impossible to lay out a Japanese national space policy containing the promotion of space industrialization and space security.

[44] Bill No. 50 of the 166th Diet.

draft Articles 2 and 14 are the most important. Draft Article2 of the bill provides that space development and use shall be conducted in accordance with international treaties and other international commitments, including the Outer Space Treaty, and pursuant to the spirit of the peaceful principle of the Constitution of Japan. Draft Article 14 stipulates the governmental responsibility to take necessary measures to promote space development and uses that will benefit international peace and safety and promote Japan's security. The word "security" appears in the bill; it is an indication that the ruling coalition parties intend to change the interpretation of "peaceful" from "non-military" to "non-aggressive." But it is not certain whether the bill will be passed as currently written.

THE USE OF OUTER SPACE FOR COLLECTIVE ASIAN SECURITY

If the Basic Law on Space Activities is passed, and the interpretation of peaceful uses of outer space is changed from "non-military" to "non-aggressive," will it affect Asian collective space security? Without having the final provisions of the adopted law in hand, it may be too early to assess or evaluate this question. But based on several factors, including serious fiscal constraints and Japan's strongly embedded peace-loving national sentiment, it can be safely concluded that a drastic shift to the pursuit of an extensive military space program could not possibly take place. It is true that the Basic Law on Space Activities may enable the SDF to own and operate its own satellites not only for surveillance, but also for telecommunications and early warning. However, this will likely be the limit of military satellite use.

As the oldest democracy in Asia, today's Japan would never develop space weapons, and its use of outer space for security reasons could be aimed at enhancing collective Asian space security. Some proposals in this respect are made in the following section.

AN ASIAN PERSPECTIVE: WHAT CAN BE DONE?

From "Space Safety" to "Space Security"

A starting point for this discussion is recognition of the fact that the foundation for Asian collective security in space is fragile, if not non-existent. Thus, as an achievable first step, it would be advisable that collective space security begin with civilian cooperation on space applications, mixed with some of the space safety measures presently being developed under UN sponsorship or in other global frameworks. Examples

include the UNISPACE III implementation programs under COPUOS (33 activities, such as capacity building, disaster mitigation, and natural resources detection), the Global Earth Observation System of Systems (GEOSS) 10-Year Implementation Plan within the Group on Earth Observation (GEO),[45] the Committee on Earth Observation Satellites (CEOS),[46] and the International Charter "Space and Major Disasters."[47] Because most of these projects involve remote-sensing data distribution, or capacity building for analyzing such data and information, making the most of such vehicles would develop Asian capabilities for future cooperation on regional security-related monitoring systems. Leadership in such cooperation could be conducted by the countries that are actively involved with each of the above-mentioned projects. China, India, and Japan have participated in the chairmanship of the UNISPACE III implementation programs; China, Japan, and Thailand are members of the Executive Committee (consisting of 12 states) of GEO; and the space agencies of China, India, and Japan are members of the International Charter.

At this stage, in order to prepare for the ultimate goal of enhancing space security, agreement on minimum legal norms in outer space has to be developed among the Asian nations. Thus, becoming parties to the four major UN space treaties should be strongly recommended at various opportunities. In this respect, the present situation is insufficient, in that only six of the 11 COPUOS members from Asia are parties to four of the UN treaties, all of which are of vital importance for engagement in space safety measure such as STM. Abiding with good faith by the UN space treaties, or at least the OST by as many Asian countries as possible, could surely promote regional TCBM. Since universal application of the UN space treaties is a regular agenda item at the Legal Subcommittee of COPUOS, members should have special responsibility to encourage Asian non-parties to ratify or accede to these treaties.

In conjunction with COPUOS, now that members' reports on the implementation of the space debris mitigation guidelines have become a regular item,[48] Asian space-faring states that are IADC members (China,

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[45] Governmental GEO was formally established in 2004 at the third Earth Observation Summit and endorsed GEOSS 10-Year Implementation Plan. GEO consists of 60 nations and EC.

[46] It is a non-governmental international organization established in 1984. Currently, 23 space agencies and 21 non-space organizations are members.

[47] Initiated by the ESA and CNES, non-governmental "Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural and Technological Disasters" was established in 1999.

[48] With the adoption of the STSC debris guidelines, that was so decided.

India, and Japan) should assist other nations in this region on how to better implement the seven COPUOS space debris guidelines.[49] As a major part of the STM concept, space debris mitigation measures could become an appropriate tool to achieve space safety as a proxy for space security. Among the seven guidelines, the fourth guideline is the most significant in space security terms. Guideline 4 (Avoid intentional destruction and other harmful activities) reads as follows:

> Recognizing that an increased risk of collision could pose a threat to space operations, the intentional destruction of any on-orbit spacecraft and launch vehicle orbital stages or other harmful activities that generate long-lived debris should be avoided. When intentional break-ups are necessary, they should be conducted at sufficiently low altitude to limit the orbital lifetime of resulting fragments.

Of course, this guideline has its limitations in at least in two way: first, the test or use of ASAT weapons is not categorically prohibited. The guideline only says that such an action should take place at sufficiently low altitude. Second, the guideline is not legally binding. Thus, double limitations are imposed, even if this guideline is thought of as an arms control measure. However, if it is seen not as an arms control measure, but instead as a TCBM action, the diligent implementation of the UN space debris guidelines by Asian nations would make ASAT testing more difficult. Such a small but significant accomplishment is what needs to be pursued at this stage of Asian space cooperation.

A FUTURE POSSIBILITY: REGIONAL SATELLITE MONITORING SYSTEM

If this first stage of conducting consistent TCBMs is successfully completed, then the region will be able to step into the next stage: setting up a regional satellite monitoring system. The notion of an Asian Satellite Monitoring System stems from a French proposal for an International

[49] Guideline 1 (Limit debris released during normal operations), Guideline 2 (Minimize the potential for break-ups during operational phases), Guideline 3 (Limit the probability of accidental collision in orbit), Guideline 5 (Minimize potential for post-mission break-ups resulting from stored energy), Guideline 6 (Limit the long-term presence of spacecraft and launch vehicle orbital stages in the low-Earth orbit (LEO) region after the end of their mission), and Guideline 7 (Limit the long-term interference of spacecraft and launch vehicle orbital stages with the geosynchronous Earth orbit (GEO) region after the end of their mission).

Satellite Monitoring Agency (in 1978 at the first special session on Disarmament at the UN GA) and from a Canadian proposal for *PAXSAT* (a space-based verification system) originally made in 1987 and then resurrected at the CD in June 2006.[50] As for Asian systems, if the ultimate targets are military facilities and similar objects in the participating states, for some period of time before embarking on such a system environmental monitoring or disaster detection and mitigation projects must be the initial first steps.

One of the possible predecessors would be "Sentinel Asia," an Internet-based, disaster information distribution network being constructed since 2005 within the Japanese-led Asia-Pacific Regional Space Agency Forum (APRSAF).[51] For the "Sentinel Asia" project, 25 agencies from 16 Asia-Pacific nations, including Japan, China, India, and South Korea, are participants.

If APRSAF is mentioned, the Chinese-led Asia-Pacific Space Cooperation Organization (APSCO) must also be discussed. The constitutive instrument of APSCO entered into force in December 2006; it is the first Asian intergovernmental space organization. The 35-article APSCO Convention was signed by Bangladesh, China, Indonesia, Iran, Mongolia, Pakistan, Peru, and Thailand in October 2005, and as of April 2007, Bangladesh, China, Mongolia, Iran, Pakistan, and Peru were members.[52] The objectives of APSCO include: promoting and strengthening the development of collaborative space programs among the member states; taking effective actions to assist the member states in space research, applications, and training; promoting cooperation in joint development of space technology and applications; enhancing cooperation to promote the industrialization of space; and contributing to the peaceful uses of outer space (Article 4).

While it cannot be denied that APSCO constitutes a major step forward for Asian space cooperation, in terms of its membership and China's dominant status, a tentative evaluation might be that APSCO will not be an appropriate platform for regional satellite monitoring, since such a satellite monitoring system would have to engage in analyzing and disseminating sensitive, remotely-sensed data and make delicate political

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[50] CD/1785 (June 21, 2006).

[51] APRSAF, set up in 1993, has been a forum to enhance regional space capabilities. Since 1993, APRSAF has held annual meetings to promote regional space utilization through an exchange of views and various cooperative programs.

[52] Article 29.1 of the APSCO Convention provides that it enters into force on the day the fifth instrument of ratification was deposited with the host government: China.

decision on compliance with the security requirements by the member states of such a system. One of APSCO's problems in this regard is that its members include Latin American and Middle Eastern nations. Also, in APSCO, China is dominant and a sense of regional cooperation is not a conspicuous feature. Considering their close ties with China in space activities, it might be a possibility that Nigeria, Brazil, and Venezuela will become members in the not-too-distant future.[53] In order to better function as a regional satellite monitoring system, equal partnership, fair and reasonable procedures to analyze data, and a disinterested assessment framework with respect to compliance with the rules of international law are strongly needed.

A new entity to be established from scratch would best serve such purposes, and it is advisable that its headquarters be placed in an ASEAN city, say, Bangkok. For a satellite monitoring system, Japanese satellites could be available once the interpretation of "peaceful uses" is changed domestically. The author's view is that a satellite monitoring system, making the most of the satellites of China, India, Japan, South Korea, and other advanced ASEAN nations, would enhance regional TCBMs and that such a second step would blossom into even greater progress toward cooperative space security in the Asian region.

[53] Brazil attended the signing ceremony, but failed to sign the convention.

SOUTH KOREAN CAPABILITIES FOR SPACE SECURITY

Kyung-Min Kim

Despite its space program's late start in the early 1990s, the Republic of Korea (ROK) has made consistent progress in its satellite development and launch vehicle technologies. Because of its late start, however, South Korea's space security capability has yet to catch up with that of more advanced countries. The particular need behind the ROK's space security capability relates to North Korea's periodic missile launches and 2006 underground nuclear test. After the North's test-firing of an intermediate-range Taepodong missile over Japan in August 1998, Tokyo announced plans to build a four-unit intelligence satellite system and has now achieved this goal. Japan's system now aims to acquire 30-cm resolution by improving upon existing capabilities. Japan's attempt to independently develop its satellite system, instead of relying entirely on U.S. technologies, is attributable to Japan's perceived discontent with the incomplete sharing of intelligence information by its main ally. Such discontent coincides with South Korea's perception of the United States. Geopolitically surrounded by four large powers—Russia, China, Japan, and the United States—the ROK is faced with difficulties in its efforts to build independent space security capabilities. Technological barriers comprise the primary hurdle that South Korea must overcome as it attempts to engage in cooperation with advanced space-technology nations and conduct indigenous research and development efforts. In order to monitor North Korea in the wake of its missile and nuclear tests, it is imperative that South Korea develop intelligence capabilities and share information.

THE NATIONAL MID-TO-LONG-TERM SPACE DEVELOPMENT PLAN AND ITS OBJECTIVES

In 1996, South Korea formulated its first Basic Plan on Mid-to-Long-Term National Space Development. The plan was updated in 2000 and again in 2005. The plan spelled out mid-term objectives to be achieved under the envisaged goal of becoming one of the world's 10 largest space powers by 2015. The mid-term objectives included: first, to acquire the

capability to launch micro-satellites by the year 2007; second, to independently develop low-Earth orbit (LEO) multipurpose satellites; and third, to build the technological basis to make inroads into the international commercial space market.

The mid-term objectives are to be achieved by three-part active space programs: to develop satellites, to build launch vehicles, and to participate in international space development programs and research efforts. The plan called for the development of 13 satellites between 1996 and 2010: seven multipurpose satellites, four scientific satellites, and two geostationary satellites. Under development at present are: the *Korea Multipurpose Satellite-3* (*KOMPSAT-3*) with a resolution of one meter or less; *KOMPSAT-3A* (carrying infrared sensors); *KOMPSAT-5* (with synthetic aperture radar technology); the *Communication, Ocean and Meteorological Satellite* (*COMS*); the *Science and Technology Satellite-2* (*STSAT-2*) (which is the nation's first dual-payload system); and the follow-on *STSAT-3*.

KOMPSATs will enable Korea to monitor the ground, ocean, and general environment with high accuracy, while strengthening the nation's security and international competitiveness in space technology. STSATs will be devoted to preliminary research and space experiments, critical to the development of multipurpose satellites. COMs will allow South Korea to locally develop a geostationary satellite and serve the needs of meteorological observation, monitoring, and the development of next-generation satellite communications.

Another leg of the basic triad space plan is the development of launcher technology. South Korea aims to independently develop and launch a LEO micro-satellite at a local launch site in 2008. By 2015, a 1.5-ton multipurpose satellite will be developed. A space center for launching the LEO micro-satellites is now being constructed, and it will be expanded to be capable of launching the 1.5-ton multipurpose satellite by 2015. The so-called Naro Space Center is located on Oenaro Island at the southwestern tip of South Korea. The construction of major facilities and equipment, except the launch pad system, was scheduled to be completed in 2007.

Research and development and South Korean participation in international space cooperation together constitute the last leg of the general plan's triad. To advance space technologies, resources have been allocated to continue the development of basic core technologies, including payloads, launchers, high-performance rocket engines, high-precision controls, lightweight structures technology, space-monitoring technology, and others. The ROK also recognizes the importance of international

cooperation for the advancement of its own space technologies. To this end, South Korea plans to participate in major international space development programs such as the *International Space Station* program and European Union's Galileo program. Bilateral cooperation with such nations as Russia, India, and Ukraine will also step up South Korea's efforts to acquire space technology. Two ROK candidate astronauts have already been selected to visit the *ISS* via Russia's Soyuz system in April 2008 after one of year training at the Gagarin Center in Russia.

THE KOREA MULTIPURPOSE SATELLITE (KOMPSAT) PROGRAM

The objective of the KOMPSAT program is to develop LEO satellites. *KOMPSAT-1* was launched to 685 km in a sun-synchronous orbit on December 21, 1999. The launch vehicle was a U.S. Taurus at the Vandenberg Air Force Base in California. *KOMPSAT-1* was co-developed by the Korea Aerospace Research Institute (KARI)[1] and the U.S.-based company TRW. The payloads of *KOMPSAT-1* contain an electro-optical camera (EOC) with 6.6-m resolution panchromatic images and an Ocean Scanning Multi-Spectral Image (OSMI) offering 1-km resolution multi-spectral images. Space Physics Sensors composed of an Ionosphere Measurement Sensor (IOS) and a High-Energy Particle Detector (HEPD) are onboard as well. *KOMPSAT-1* has given KARI a basic understanding of system engineering for satellite development. With a lifespan of three years, it completed its mission of the cartography of the Korean Peninsula, ocean observation, and measurements of high-energy particles and the ionosphere.

Conceived in December 1999 to develop a highly advanced remote sensing satellite, the *KOMPSAT-2* program made great strides based on the technologies obtained from the *KOMPSAT-1* program. *KOMPSAT-2* was launched on July 28, 2006, in Russia by a Rockot launch vehicle. A high-resolution panchromatic imagery of one meter (four meters in color) was achieved by a multispectral camera (MSC) jointly developed by the KARI and Israel's Elbit Systems Electro-Optical (ELOP), Ltd. Being able to recognize buildings and items as small as cars, *KOMPSAT-2* was put to practical use in many areas, including natural disaster surveillance, construction of a geospatial information system (GIS), and map-building.

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[1] Established in 1989, the Korea Aerospace Research Institute (KARI) has been devoted to fulfilling its role as the leading national aerospace R&D institute in South Korea. R&D activities at KARI are organized around three main areas of development: aircraft, satellites, and launch vehicles. See: http://www.kari.re.kr.

The development of *KOMPSAT-3* set out in July 2004 is still under way and scheduled to be completed in 2009 for launch. It is being developed by KARI with technical support from EADS Astrium. South Korea will leverage another big stride through this satellite's development by making inroads into the international space market. At a sun-synchronous orbital altitude of 685 km, the same as its two predecessors, the 900-kg satellite will be able to capture less-than-one-meter resolution images of the Korean Peninsula for a period of four years. The high-resolution electro-optical images required for GIS development and the monitoring of the environment, agriculture, and the ocean will better serve the nation's needs than previous versions.

KOMPSAT-5, conceived in 2005 for launch in 2008, is set apart from previous KOMPSATs in that *KOMPSAT-5* uses the nation's first all-weather synthetic aperture radar (SAR). The SAR is being jointly developed by the KARI and Alcatel-Alenia. At a 550 km sun-synchronous dawn-dusk orbit, it will use an X-band SAR for observation over a period of five years. It is expected to heighten the nation's level of technology in order to design and develop satellites complementary to optical-image satellites.

KOMPSAT-3A, the last in the current KOMPSAT series, to be launched by the end of 2012, will be mounted with an infrared Electro-optical (EO/IR) camera. This EO/IR equipped satellite will serve both military and civilian purposes. It will be capable of all-weather monitoring around the clock and will be able to detect camouflaged enemy facilities by analyzing multiple bands of light.

SPACE LAUNCH VEHICLES AND THE SPACE CENTER

South Korea's first satellite was launched by a French Ariane launcher in August 1992. Nine other satellites have since been launched into the space by foreign launchers. It has been Korea's long-awaited wish to launch its satellites from South Korea without resort to foreign technologies and launchers. Ten years after the beginning of the space research program, there is a ray of hope now to turn that dream into reality.

On November 28, 2002, the Korea Sounding Rocket (KSR)-III was successfully launched by KARI with indigenously developed technology. Flying as high as 42.7 km for 231 seconds and traveling 79 km before falling into the West Sea,[2] South Korea's first liquid-propellant rocket set a new milestone in the nation's effort to develop indigenous space launch

[2] [Editors' note: This body of water is also known as the Yellow Sea.]

technology. Since liquid-propellant rockets are a prerequisite for satellite launches, KSR-III laid the groundwork for an indigenous South Korean space launch program.[3]

KSR-III weighed 14.7 tons and had a length of 13.4 m. Although it was not powerful enough to launch a satellite, KARI was able to acquire basic technologies for building a liquid-propellant engine for a space launch vehicle. Also, KSR-I and KSR-II were domestically produced and launched. Conceived by the KARI in 1990, KSR-I was launched on June 4, 1993, and again on September 1, 1993. It was a single-stage unguided solid-propellant scientific rocket with a length of 6.7 m, a diameter of 0.42 m, and a lifting capacity of 1.2 tons. Carrying an ultraviolet radiometer, it measured the vertical ozone distribution in the stratosphere over the Korean Peninsula. Temperature, acceleration, and other parameters were also measured to examine the rocket's performance during its test flights. KSR-I had a payload capacity of 150 kg and could reach an altitude of 75 km.

KSR-II was a two-stage solid-propellant scientific rocket developed for scientific experiments in the upper atmosphere. Building on the experience and technology acquired from KSR-I, KSR-II, launched in 1997 and 1998, was powerful enough to reach a maximum altitude of 150 km and higher. It had a length of 11.04 m, a total weight of 2 tons, and a diameter of 0.42 m. The rocket measured vertical ozone distribution, ionosphere electron density, and temperature.

The liquid-propellant rocket KSR-III allows a more stable supply of fuel and easier speed control, critical to more advanced space launch systems. The use of a cryogenic oxidizer in parallel with high-temperature combustion requires a solid engine system. The most difficult part was to stabilize the combustion, for instability melts down engine parts and damages launcher structures. In this regard, it is significant that KSR-III was developed using entirely domestic technologies.

Though KSR-III was deemed to be a precursor to South Korea's full-fledged space launch programs, KARI realized that that indigenous development of a space launch vehicle was a very long and difficult process especially when faced with advanced countries' reluctance to share core technologies and experience. It requires much stronger propellant power than KSR-III possessed to launch a satellite into orbit. Against this backdrop, the Korea Space Launch Vehicle (KSLV)-1 project is under way to send a micro-satellite into orbit from Korea.

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[3] Yonhap News, interview with Dr. Cho Gwang-rae, Chief of Space Launch Vehicle Division of the Korea Aerospace Research Institute, December 4, 2006.

In a technological partnership with Russia, the ROK plans to use the KSLV-1 to independently launch a 100 kg micro-satellite in 2008 from new Naro Space Center. KSLV-1, whose development started in August 2002, is expected to be capable of reaching 300 km. in altitude and is 33 m. in height and 140 tons in weight, much larger than KSR-III.[4]

Only eight countries have their own viable space launch vehicles. The United States continued its space program despite the 2003 Space Shuttle *Columbia* accident. The world's first satellite launcher that the Soviet Union used to send the *Sputnik-1* shock around the world has launched thousands of satellites into orbit over the past five decades. Japan successfully launched a satellite in 1994 with its independently developed H-2 launch vehicle. China launched its first manned space mission *Shenzhou 5* in 2003, becoming the third country in history to send a person into orbit. A successful launch of KSLV-1 would make South Korea the world's ninth to independently launch a satellite into orbit.

The ROK joined the Missile Technology Control Regime in 2001. The MTCR limited South Korea's missile systems to 300 km, but it does not restrict non-military technologies. As such, the ROK has started to build its new space center. The Naro complex will have state-of-the-art facilities, including storage and supply facilities for liquid propellants, an assembly complex, tracking and controlling facilities, a ground test facility, remote data communication centers, and other technologies. It will also host a Space Education and Exhibition Center for the public to learn more about the country's space programs. The center is important in that it will not only empower South Korea to make cost-effective indigenous developments of space programs without recourse to uncooperative foreign competitors, but also foster the growth of industries in such related areas as electro-communications, control systems, precision measurements, and others. As a strategic hub, it will in turn play an active role in contributing to collective security in space, as well as to multilateral international space programs.

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[4] Chin Young Hwang, "Space Activities in Korea-History, Current Programs and Future Plans," *Space Policy* 22 (2006), p. 198, at: www.sciencedirect.com.

THE NEW SPACE DEVELOPMENT PROMOTION BASIC PLAN[5]

The Korean government unveiled the Space Development Promotion Basic Plan on June 20, 2007, building on the existing Basic Plan on Mid-to-Long-Term National Space Development.[6] The new Basic Plan sets guideline for the 10-year period from 2007 to 2016. Under the new plan, the timing of certain planned launches was delayed by a couple of years: *STSAT-2* from 2007 to 2008; *KOMPSAT-3* from 2009 to 2011; *KOMPSAT-5* from 2008 to 2010; and *COMS* from 2008 to 2009. KSLV-1 will be launched in 2008 and the construction of the Naro Space Center will be completed by 2008. This ambitious basic plan is geared more toward acquiring core technologies for satellites and launch vehicles than meeting deadlines for satellite launches. It even outlines planetary exploration after 2017, enlarging the nation's vision beyond the boundaries of Earth. Departing from the previous plan to develop KSLV-II by 2015, the government now plans to use entirely local technologies for this system, as was the case with South Korean-standard nuclear reactor.

The government estimates that 3.6 trillion won (a little over U.S. $4 billion) and 3,600 personnel will be needed to realize the 10-year plan, compared to the 1.7 trillion won spent during 1996-2007 period for the space program.

CONCLUSION

Just as Japan's full-fledged development of a reconnaissance satellite system was prompted by North Korea's missile tests, South Korea's space developments can be attributed to perceived threats posed by North Korea's weapons of mass destruction and missiles. Geopolitically surrounded by the space superpowers of Russia and the United States and by the neighboring space powers of China and Japan, South Korea has yet to build its own space security capabilities. In the face of the seemingly agreed-upon grand goals and ideals of peaceful, collective development of space, it is an undeniable fact that space has become an area of competition

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[5] *Space Vision 2016: 1st Basic Plan on Space Development Promotion (Draft)*, June 20, 2007. Drafted by the Ministries of Science and Technology, Foreign Affairs, Defense, Government Administration and Home Affairs, Commerce, Industry & Energy, Information and Communications, Construction, Marine Affairs and Fisheries, and Planning and Budget.

[6] Park Sang-hyeon, "3.6 T Won for 10-year Space Program: Independent Space Technology Development Begins," *Digital Times*, June 21, 2007.

up for grabs by the leading space powers. The ROK is neither capable of nor willing to exploit space economically and militarily like other space powers. It merely wishes to build its own capability to gather information aimed at identifying the existence of any security threats across the border. It is well documented that the United States was able to secure its strategic reconnaissance capability during the Cold War beginning with a satellite program code-named CORONA.[7] It is also well known that the U.S. Defense Support Program satellites proved to be very effective during the 1991 Gulf War in detecting Iraqi Scud missile launches, providing timely warning to civilian population in Israel, and to Coalition forces in Saudi Arabia.[8] Besides security concerns, South Korea sincerely hopes to share information on space security and to participate actively in the peaceful development of space through close cooperation with neighboring countries.

To South Koreans, the notion of a "space program" still sounds exotic and adventurous. Some critics argue whether it is worthwhile to spend an astronomical amount of money to venture into the unknown. With limited resources on Earth, it takes a national consensus to build a comprehensive space program. It will likely take several more years before South Korea achieves one-meter resolution in its observation satellites. The ultimate goal of the ROK's space program is not only to counter potential threats from North Korea, but also to be an integral part of international cooperation in promoting shared prosperity through the peaceful development of space.

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[7] Dwayne A. Day, John M. Logsdon, and Brian Latell, *Eyes In the Sky: The Story of the CORONA Spy Satellites* (Smithsonian Institution, 1998).

[8] Jeffery T. Richelson, *America's Space Sentinels: DSP Satellites and National Security* (Lawrence, KS: University of Kansas Press, 1999), pp. 157-175.

CHINA AND SPACE SECURITY

Zhong Jing[1]

Over the past half-century, mankind has taken great strides in space exploitation and achieved considerable progress. As a result of this process, human society and outer space are becoming increasingly inseparable. Although there are no weapons deployed in space today, it is undeniable that the space situation is serious and that a trend toward space's weaponization has been conspicuous in recent years.

Recent changes in the space situation mainly stem from current international politics, economics, and the related scientific-technological environment. The end of the Cold War and the collapse of the Soviet Union have left the United States as the only superpower, and it now displays increasing strength and ambition in outer space. Meanwhile, as a new territory for human exploration and the last frontier for human existence, space is regarded both as a reflection of a country's technological prowess and as a key to its future economic development. As a result, most countries are striving to possess their own assets in outer space. In addition, since the most obvious characteristic of high technology in the information era is its rapid diffusion, it is impossible for any country or organization to monopolize space technology for long. With a new century settling in, more and more countries are beginning to step forward to enter space. Against this backdrop, many observers and analysts have claimed that an era of space competition has arrived.

EMERGING CHALLENGES TO SPACE SECURITY

Space security is confronted with unprecedented challenges that are different from those of the past. If these are neglected and mishandled, the resulting fallout could lead to further vulnerabilities in outer space, and even to conflicts.

Three major future challenges have emerged, which will be discussed in detail below. First, the recent changes in U.S. space policy and doctrine are creating a serious risk of reigniting a new

[1] The views expressed here are entirely the author's, and do not necessarily represent those of the National Defense University or any other organization.

round of competition among the major powers in space and generating new vulnerabilities. At present, the most important factor resulting in space instability is U.S. policy. With a clear ambition to monopolize outer space, the George W. Bush administration's space policy has upset other countries. The latest U.S. National Space Policy (NSP), released in October of 2006, has obviously shifted away from the Clinton administration's emphasis on diplomatic tools to ensure space security to one emphasizing military freedom of action in space over all other requirements. The new space policy seeks to "enable unhindered U.S. operations in and through space to defend our interests there,"[2] stating that "Freedom of action in space is as important to the United States as air power and sea power."[3] The new policy also affirms the U.S. right to "…deny such freedom of action to adversaries."[4] Meanwhile, the administration's 2006 space policy rejects future treaty negotiation or other binding measures to regulate space activities, in favor of keeping open all U.S. options, including space-based anti-missile systems. It emphasizes that "the United States will oppose the development of new legal regimes or other restrictions that seek to prohibit or limit U.S. access to or use of space. Proposed arms control agreements or restrictions must not impair the rights of the United States to conduct research, development, testing, and operations or other activities in space for U.S. national interests."[5] This effectively undermines any potential initiatives put forth by the international community on space's non-weaponization. What is particularly worth mentioning is that the missile defense system being vigorously pushed by the United States is a *de facto* step that will lead to space's weaponization. The U.S. military holds the notion that its missile defense system is a *defensive* weapon system. However, in fact, it may not be. Defensive technology can easily be changed into offensive technology and used in offensive operations, since the border between offensive technology and defensive technology is blurring. As we all know, it is very easy for anti-missile technology

[2] U.S. National Space Policy, see the online version at: http://www.ostp.gov/.
[3] Ibid.
[4] Ibid.
[5] Ibid.

to be used for anti-satellite purposes. Moreover, if a country's defensive capability against missiles increases, then its offensive capability with its own missiles will be accordingly raised to a new level. This will inevitably undermine strategy stability. Recently, the U.S. bid to base elements of an anti-missile system in Poland and the Czech Republic is provoking strong reactions from Russia, including hints that it might abrogate the 1987 Intermediate-Range Nuclear Forces (INF) Treaty. Some experts have deduced that the U.S. could test capabilities for space weapons via missile defense tests. The current Bush administration's proposal for missile defense goes a long way towards preparing for the deployment of space-based weapons. It has also been reported that a fleet of space planes would be designed to attack and destroy future hostile satellites. If technically elaborated, this would constitute a major change in the way that the world might view space in the future.

The Bush NSP's move toward a more militarily-oriented and unilateral approach to space security will have a far-reaching impact on other countries. Faced with a United States obviously seeking absolute security and a sole monopoly over the use of space at the expense of the security of all other countries, it is normal and almost certain that other countries will make corresponding plans to counter the ascendant U.S. monopoly power in space. It is reported that Russia, the European Union, China, India, Japan, South Korea, and other space powers have major plans for space exploration. Russia, another space power, has identified space capabilities as vital to maintaining the country's status as a world power. Its "2006-2015 Space Exploration Plan," whose main task is to launch more than 70 new satellites in the next 10 years, was approved on July 14, 2005. Japan also has a strategic plan focusing on intelligence gathering by launching spy satellites to monitor activities worldwide (and among its neighbors particularly). Even more worrisome, in March 2006, Japan's ruling party declared that it was seeking to end a several-decades-long decree that against the development of military space capabilities and is instead preparing to develop a new legal protocol for space. This new legislation would permit it to develop non-offensive military space capabilities and may soon be submitted to the Diet. In addition, India is now active with a bold agenda for space, so as not to fall behind. By 2013, it hopes to launch a probe to Mars. Later that decade, it could send up its first "gaganaut"—a suggestion for a Sanskrit version of "astronaut"—and

even visit the Moon.[6] Meanwhile, India insists on integrating space assets into its military command and control system. Therefore, the U.S. space monopoly is triggering a new round of competition in space. As Kenneth N. Waltz has argued, "As ever, dominance, coupled with immoderate behavior by one country, causes others to look for ways to protect their interests."[7] Many examples in history illustrate how uncontrolled competition in developing advanced technology can lead to escalation and generate action-reaction spirals. Space competition could become a case in point.

Second, with the rapid development of space technology, space power has become tightly linked with land power and become the most important component of the future "integrated battlefield." Since the end of the Cold War, four major military conflicts have take place, all of which could be characterized as "high-tech" wars. These are: the Gulf War in 1991, the Kosovo War in 1999, the Afghanistan War in 2001, and the Iraq War in 2003. In all of these wars, space power had played a very important role. Furthermore, its significance is increasing with each passing war, given the rapid development of space technology. According to an estimate from a war-game simulation, it is believed that combat effectiveness can increase at least 50 to 100 percent with the application of space power. One U.S. military expert even commented that if "space war" was only an infant in the first Gulf War, then it now is growing up with light speed. In the Iraq War, for the first time, space power enabled the coalition forces to integrate all their assets into joint operations to such an extent that many observers thought that the Iraq War was indeed the first real "Space War" in human history. Space warfare, as a new pattern of future war, is divided into two phases by this U.S. expert: the first phase of "Space War" features a compact linkage between space and Earth operations. The establishment of new concepts of space operations, space weapons, and space forces will be signals of the second phase of space warfare.

According to these theories and given the benefits of space power in recent wars, the United States has taken great pains to adopt a policy of developing space technologies to enhance and integrate its military power. Based on the understanding that the center of gravity of the future battlefield is an effective system of command, control, communications, computers, intelligence, surveillance, and reconnaissance (C^4ISR), the most critical part of which are all kinds of satellites, the U.S. military is trying

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[6] "India raises the ante on its space program," *Christian Science Monitor*, January 11, 2007, at: http://www.csmonitor.com.

[7] Scott D. Sagan and Kenneth N. Waltz, *The Spread of Nuclear Weapons: A Debate Renewed* (New York: W.W. Norton, 2003), p. 149.

hard to establish an integrated battlefield, by further engaging space power into global military deployments at every level: from strategy to tactics. Since the effective use of space assets has become a determinative factor in wars, it has now become highly likely that satellites and other space assets could become targets subject to attack or deception during a major conflict. Even primarily civilian satellites will likely be attacked, as they play a significant supplementary and substitute role for military satellites. Thus, due to an integrated battlefield and the strategic significance of space assets, space conflict will almost certainly lead to escalation of such wars. From a long-term perspective, with a tighter linkage between space and land in the future, the possibility of space conflict among big powers will increase if there are no effective measures to prevent it. Even an accident or misjudgment in space could possibly expand into a conflict or war.

Third, space weapons might be hidden in civil space assets, given the dual-use nature of space technology. At present, the borderline between emerging military and civilian technologies is becoming increasingly blurred. This fuzziness is reflected not only in the overlapping of key technologies in the military and civilian fields, but also in the overlapping of future development trends for these different key technologies. Space technologies are a case in point. It is sometimes difficult to tell the difference between military and civil uses. For example, the use of solid propellant in certain rocket boosters is puzzling. The development and production costs for such fuel, as well as launch expenses, are so high that they are hard to justify on commercial grounds. However, solid booster may be directly used in ICBMs. Therefore, many civil space items have shadows of military purposes. As Joan Johnson-Freese has pointed out, "Specifically, there is no distinction between space technology for civil or military use, since 95 percent of space technology is dual-use, and further—and really problematic—there is often little or no distinction between military technology that is offensive or defensive in nature."[8] How to regulate space items to both ensure equal rights to peaceful uses of space while guaranteeing that no military intentions are involved has become an emerging challenge in this new era.

CHINA'S CONCERNS AND POSITION ON SPACE SECURITY

With the continuous expansion in the development and application of space technology and given the unpredictable security situation in outer

[8] Leonard David, "U.S.-China Space Ties Weighed," April 20, 2006, at: http://www.space.com/.

space in the 21st century, China will make efforts to protect its legitimate interests. It will also pay more attention to space security and stability, and more importantly, to promoting the ability of all countries to participate equally in friendly space exploration.

First, China is taking an active part in space exploration and unflinchingly adopting the road of peaceful development. According to the 2006 White Paper on China's space activities, China considers "the development of its space industry as a strategic way to enhance its economic, scientific, technological and national defense strength, as well as a cohesive force for the unity of the Chinese people, in order to rejuvenate China."[9] The development of space activities is encouraged and supported by the government as an integral part of the state's comprehensive development strategy and makes due contributions to the peaceful uses of outer space and to the civilized progress of mankind. For example, China's satellite telecommunications and broadcasting play an irreplaceable role, particularly in the vast countryside via projects "to give every village access to broadcasting and TV" and "to give every village access to telephones." China's meteorological satellite provided observation data to all countries in the Indian Ocean damaged by the tsunami in the summer of 2005.

Furthermore, in light of the country's current situation and needs, China has chosen some limited targets and has concentrated its strengths on key areas for making breakthroughs on a limited scale. In fact, there are huge gaps between China and the major space powers, and no special advantages in comparison even to countries such as Japan and India, although China has launched its manned "Shenzhou" spacecraft, realizing the Chinese dream of several thousands of years. In this case, even if for the purpose of reducing the current gap between China and the major space powers, the huge investments required will not only impact the research and development expenditures for other scientific-technological items, but also harm the rational assignment of expenditures in plans for integrated scientific and technological development. Especially, what can be achieved on Earth via such huge investments will also have to be considered and consistently weighed. Therefore, given its objective requirements and technology capabilities, it is rational and wise for China to focus on certain crucial areas of space that will benefit the national economy and people's livelihoods over the long term.

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[9] See the full text of "China's Space Activities in 2006," at: http://news.xinhuanet.com/english/2006-10/12/content_5193446.htm.

Second, to ensure the peaceful use of outer space, prevent the weaponization of outer space, and avoid an arms race in outer space, it is urgent for the international community to begin the negotiation of a treaty on space's non-weaponization. The experience of humanity's conquering of space is the same as that of conquering the sea and the sky. When mankind conquers a new environment, chaos ensues, because more and more entities and activities begin and acquire their own interests. Given this scarcely tolerable confusion or even latent crisis, new regulations need to be made by the international community on the basis of the consensus of many nations. Nowadays, space security is at a turning point, which may be the last opportunity for humanity to regulate space technologies and enhance space management for avoiding space's weaponization and protecting the vulnerable space environment. That is why the international community should enhance the sense of urgency of calls for immediate action to put the arms control efforts on the right track.

Since the 1980s, China, Russia, and other countries have been initiating and supporting space's non-weaponization.[10] Outer space belongs to all mankind and should be used exclusively for peaceful purposes to benefit humanity. To this end, China stands for the complete prohibition and thorough destruction of weapons deployed in outer space. China has consistently maintained that the UN Conference on Disarmament (in Geneva) should negotiate and conclude an international legal instrument on preventing the weaponization of outer space. In order to be effective, this international legal instrument should, at a minimum, include pledges by the signatories:

- Not to test, deploy, or use in outer space any weapons, weapon systems or their components;
- Not to test, deploy, or use on land, in the sea or atmosphere any weapons, weapon systems or their components that may be used for war-fighting in outer space;
- Not to resort to the threat or use of force against any outer space

[10] As early as 1985, China submitted to the UN Conference on Disarmament (CD) a working paper entitled "The Basic Standpoint on Preventing the Arms Race in Outer Space" (CD/579). In February 2000, in another working paper (CD/1606) put forward to the CD, China expounded on its position and proposals on how the CD should deal with the issue of the prevention of an arms race in outer space, including some tentative ideas about the basic elements of the envisaged legal instrument. In June 2001, China submitted further proposals (CD/1645) on the possible main elements of the proposed legal instrument.

objects; and

- Not to assist or encourage other states, groups of states or international organizations to participate in activities prohibited by the treaty, etc.[11]

Third, a very effective approach for the international community would be to call for space cooperation to reducing mutual suspicion and achieve mutual benefits in future space security. Given the world's rapidly growing reliance on satellites, coupled with advances in weapons technology, the development of wider and deeper cooperation to enhance mutual understanding and trust may be demanded to provide adequate space security for all who depend on the ability to access and use the space environment. Fruitful cooperation will promote international exchanges, technical assistance, and cooperation for peaceful purposes so that all countries can share in the economic and technological benefits of scientific advances in outer space. China has been persistent in seeking to "strengthen exchanges and cooperation in this field with other countries on the basis of the principles of equality, mutual benefit, peaceful utilization of outer space and common development."[12] China has developed bilateral space cooperation with a host of countries and propelled multilateral cooperation in space technology and its application in the Asia-Pacific region.[13] In particular, China emphasizes space cooperation with developing countries. For example, China continues to collaborate with Brazil on the Earth Resources Satellite program. Following the successful launch of the *Sino-Brazilian Earth Resources Satellite 2* in October 2003, the Chinese and Brazilian governments signed supplementary protocols on the joint

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[11] See Qiao Zhonghuai, "An Effective Way to Prevent an Arms Race in Outer Space: The Early Negotiation and Conclusion of an International Legal Instrument," presentation at the United Nations Conference on Disarmament at Beijing on April 2, 2002, online at: http://www.fmprc.gov.cn/eng/29794.html.

[12] See the full text of "China's Space Activities in 2006," at: http://news.xinhuanet.com/english/2006-10/12/content_5193446.htm.

[13] China has successively signed 16 international space cooperation agreements and memorandums with 13 countries, space agencies, and international organizations. In October 2005, the representatives of China, Bangladesh, Indonesia, Iran, Mongolia, Pakistan, Peru, and Thailand signed the Asia-Pacific Space Cooperation Organization (APSCO) Convention in Beijing. In June 2006, Turkey signed the Convention as well. APSCO will be headquartered in Beijing. This marks a significant step toward the official establishment of APSCO. For details, see the full text of "China's Space Activities in 2006," at: http://news.xinhuanet.com/english/2006-10/12/content_5193446.htm.

research and manufacturing of satellites 2B, 3, and 4, and on cooperation in a data application system.

RECOMMENDATIONS

Space security is at a crucial crossroads. The international community should take active and effective measures to contain the tendency toward the weaponization of space and drive space activities into the right track of peaceful uses to serve all humankind.

First, establishing a new security concept is a key point for ensuring space security. If we keep the old model of conceiving of an enemy as the main opponent, space progress will be a "zero-sum" game in which any advance made by either side is harmful to the security of the other side. Therefore, it is important for states to give up the Cold War concept that is based on ideology and establish instead a new concept of cooperative security. More and more countries have acknowledged that individual nations cannot achieve space security only by depending on themselves and that military advantage in space only can ensure space security for a short period of time, yielding to greater insecurity in the long run since one's own security creates insecurity for other countries. Cooperative security is the only wise and realistic approach to ensuring space security.

Second, the enhancement of mutual exchanges and understanding is an important strategic measure for achieving the aim of space security. Besides official channels, track-two exchanges are also taking an active role in establishing confidence-building measures. It is through strategic-level talks and academic exchanges with different forums that the international community can convey a clear and consistent message, improve dialogue, and lay a foundation of moving toward greater cooperation.

Third, and most important, it is urgent for states to begin the negotiation on treaty of space's non-weaponization to prevent an arms race and to reduce the rising tension in outer space. The international community does not want to wait any longer.

SPACE SECURITY: REASSESSING THE SITUATION AND EXPLORING OPTIONS

Kiran K. Nair

The theory of perspectivism states that knowledge of a subject is inevitably partial and limited by the individual perspective from which it is viewed.[1] This theory applies in no small measure to perceptions of security (and insecurity) in outer space. Feelings of insecurity in space have largely been based on perceptions of one's own vulnerabilities in and from space. These perceptions are also distinct in the cases of most nations, leaving little scope for mutual redress of individual insecurities. For example, the U.S. perception of space security in a military context differs from that of Russia or China, and vice versa. At the same time, certain common hazards that add to the insecurity index in space are common to all, irrespective of individual perception. These factors are no less potent than military factors and are getting increasingly hazardous, and yet relatively lesser effort has gone into mitigating insecurities on account of them. In addition, unlike in the case of national military perceptions about security, which differ grossly (leaving lesser scope for agreements), a widely shared desire to eliminate common environmental and other insecurities does exist in space.

This paper attempts to highlight this point of view and advocates an additional and more intense refocusing on aspects related to common vulnerabilities in line with the changed (and changing) dynamics of space security.[2] The above may appear to be the easier recourse and perhaps it is so. The more difficult issue of eliminating insecurities in space due to national military activities has been deliberated upon innumerable times in the last few decades without much headway. In the absence of any significant breakthrough in the above impasse, alternative approaches to space security have to be explored. This is especially true because there

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[1] This theory was first articulated by Friedrich Nietzsche in his 1876 work *Will to Power*.

[2] The definition of space security as "secure and sustainable access to and use of space; and freedom from space-based threats" drawn from the *Space Security 2007* research report is the template referred to. See: http://spacesecurity.org.

appear to be greater chances for a breakthrough in the easier alternatives and because non-military hazards also have a much greater potency today for causing insecurities in space. Lastly, headway in the non-military aspects of space security might in the future open the gates to ending the impasse in its military aspects.

REASSESSING THE SITUATION

To begin with, the leading factors in insecurity are also not constant and hence demand a reassessment of the situation in space. Space was initially perceived to be useful largely for military and scientific purposes, and the only space players were the two superpowers: the United States and the Soviet Union. The primary perceptions of insecurity in space in the aftermath of *Sputnik* in 1957 were initially related to high-level observation and ordnance delivery, followed by the possibility of conventional and nuclear war-fighting by the two nuclear superpowers in and from space. The signing of the Limited Test Ban Treaty in 1963 reduced the scope of nuclear conflicts over space, though not of conventional conflicts. The conventional conflicts continued and intensified with the "Star Wars" era of the 1980s. Periods of relative calm prevailed following the unilateral moratorium by the Soviet Union on anti-satellite tests; the United States followed suit in 1985. These periods of relative calm continued in varying measures until the end of the millennium.

The 1991 Gulf War demonstrated the enormous impact of space in enabling decisive military outcomes. The same period also witnessed a greater diffusion of space technologies across the globe and the greater utility of space for non-military purposes. Thus, a larger number of nations today draw military capabilities from space and, on the other hand, an even larger number of states and non-state actors draw commercial, civil, and other benefits from space. The number of space actors keeps rising and is expected to rise further. The rise is also chaotic and unpredictable. Newer (and more diverse) utilities join the growing list of those drawing upon space resources, without a parallel dynamic system of regulation. The prime determinants of insecurity in space have changed over the last five decades and have risen exponentially with changing times. Apart from the conventional and well-known factors of military insecurity in space, the non-military hazards in space continue to grow at an alarming pace, with very little regulation to mitigate them.

Additionally, existing legislation is overwhelmingly designed for regulating the behavior of state actors in space.[3] Overall, while state actors in space are largely amenable to international regulations and can be held accountable for causing insecurities in space, the same does not hold true (at present) for all non-state actors. While the number of non-state actors in space is rising, legislative and other efforts aimed at regulating their activities are not. For example, commercial space launch companies include Sea Launch, an international consortium that launches from the sea and not national territory. Such non-state actors are largely out of the scope of prevailing legislation, which is overwhelmingly focused on regulating the behavior of states. To complicate matters further, unlike in the past military capabilities in space are no longer the exclusive purview of states. Military capabilities in space can now be obtained from a variety of sources, including commercial satellites with mixed national allegiances and ownership. For these reasons, the legislative and operational military complexities in space are rising as never before.

The complexities in mitigating the factors of insecurity are expanding beyond conventionally known parameters. Efforts to contain insecurities in and from space have not evolved at a similar pace, nor have they adapted to changing times. No reciprocally dynamic and imaginative system to anticipate and attempt mitigation of additional factors creating insecurity in space is in place. Residual emotions and experiences of the post-World War II and Cold War era continue to drive the efforts to contain insecurities in space. As indicated previously, most prevailing legislation for addressing insecurities in space was designed for containing the destructive proclivities of the two nuclear superpowers of those times. The focus of efforts has largely been (and continues to be) on regulating activities of nation-states in outer space, which have been historically perceived to be the bane of space security. This lopsided focus doggedly prevails, continuing to the present, and is expected to continue in the near future with no reciprocal guarantee of success.

The bleak success rate in containing the military activities of nation-states is especially evidenced when considering the deadlocked situation since 1998 at the UN Conference on Disarmament (CD). China's anti-satellite (ASAT) test on January 11, 2007, further validates this

[3] The existing provision for states covers activities with clear national allegiances. The Outer Space Treaty of 1967 has no provision for private commercial operators; they are only regulated to the extent of states being held liable (under Articles 6 and 7) for national activities in outer space by governmental or non-governmental agencies.

premise, as does the greater hardening of the U.S. stance following the ASAT test. The prime reason for the above impasse is that military activities typically are areas of intense national allegiance aimed at allaying *national* insecurities and protecting *national* interests. Assessing and comprehending these insecurities and attempting to obtain mutually agreeable solutions are enormously complicated tasks and less-than-promising ones at present. The near-term foreseeable future shows no greater promise. The existing position in space inspires little confidence, and a realistic audit displays very little hopes of influencing the military behavior of states. At the same time, it would also be imprudent to renounce efforts in this direction. In the aftermath of the Chinese ASAT test, an increased focus on regulating mutually debilitating military activities in space is expected and would be a welcome move toward enhanced space security. Overall, there is no disputing the fact that the prevailing situation demands increased effort and focus; at the same time, it also demands a matching focus on other lesser-known factors behind insecurity in space.

EXPLORING OPTIONS

In view of the foregoing, it is essential to explore lesser-known areas of reduced national allegiance in space, which affect not only states but such non-state entities as commercial firms, industrial conglomerates, insurance companies, individuals, and the like. Areas of common insecurity affecting all interested parties in space include: orbital debris, increasing traffic, conflict over space resource allocations, and others. These are less contentious and less well known, but with the potential for disastrous consequences. They are also areas where the insecurities need to be addressed in the short run. On the other hand, unlike insecurities stemming out of the military activities of states, these areas—because of their indiscriminate nature—are more amenable to equitable security arrangements via mutual agreement and negotiation. Thus, the chances of redressing these insecurities should be greater. The possibility also exists that demonstrated progress in resolving these space security issues would trigger new possibilities for breaking deadlocks in more contentious areas.

It is fairly well known that high-speed orbital debris is one of the prime factors underlying insecurity in space. Some quarters aver that China's recent ASAT test added the largest amount of debris in a single

instance.[4] Such events are episodic, largely unpredictable, and hence have enormous shock value. The spotlight dwells largely on these aspects, while the less-visible aspects of debris—perennially accumulating on account of spent rocket stages, residual fuel, discharged batteries, and other factors—are lost sight of. As a consequence, while enormous effort goes to contain episodic events, not much effort goes into the containment of the less-visible but more regular factors. Meanwhile, these factors, which are equal if not greater contributors to destructive interference, keep accumulating. As a matter of fact, as of December 2003, the largest element of the cataloged Earth satellite population is not comprised of satellite fragmentation debris, with discarded rocket bodies being the source of nine of the 10 largest debris clouds in orbit.[5]

The figure below reveals that until December 31, 2003, the primary causes of satellite breakups were propulsion-related events,[6] followed by deliberate actions. Deliberate actions have often been associated with activities related to national security. After January 11, 2007, the figures for deliberate action or for activities related to national security have registered an increase. Nevertheless, the point is that rocket propulsion is an equal, if not greater, contributing factor to debris and consequent insecurity in space. Thus, it would serve everybody's purposes to implement measures to contain debris resulting from propulsion-related activities.

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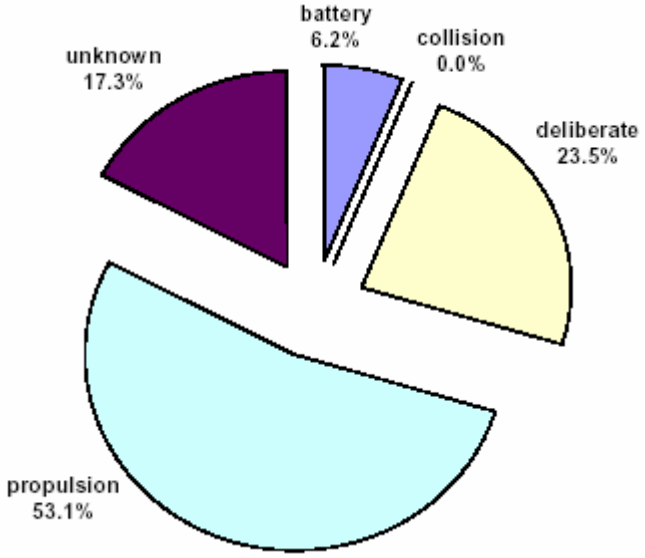
[4] Frank Morring, Jr., "Worst Ever: Chinese anti-satellite test boosted space-debris population by 10% in an instant," *Aviation Week and Space Technology*, February 12, 2007, p. 20.

[5] NASA Orbital Debris Program Office, "History of On-orbit Satellite Fragmentation," 13th Edition, May 2004.

[6] Propulsion-related breakups include catastrophic malfunctions during orbital injection or maneuvers, subsequent explosions based on residual propellants, and failures of active attitude control systems.

Figure-1: Proportion of all cataloged satellite break-up debris



Source: NASA's 13th Edition of Breakup Book (2004).

The first rockets were injected into orbit much before ASATs were conceived of. Yet, while enormous effort goes into making rockets more powerful or cost effective, scant (if any) attention is paid to design them in an environmentally friendly manner.[7] The basic drivers and yardsticks of rocket performance have been continuing largely unchanged ever since the first rockets dumped their spent stages, residual fuel, and other debris in space. Refinements in rocket design and technology continue to be dictated by mission, efficacy, and economic considerations, but very rarely environmental considerations. Thus, space launches even today are characterized by the same attendant spent stages and other elements being added to existing debris. Until now, no worthwhile environmentally friendly rocket designs or technologies have been conceived of or have actually come about that are bereft of the attendant debris. Rocket performance and payload quality have improved over the ages; nonetheless, the same cannot be said of the space operating environment. The quality of the operating environment has degraded and continues to dip with every

[7] [Editors' note: This comment may be truer for Indian launch vehicles than it is for the newest Western launch vehicles. China's Long March 5 launcher, planned to enter service in 2013, also is being designed to minimize debris creation.]

passing day. With regards to space, both the platform and the environment are crucial and complementary partners; one cannot advance in isolation or at the cost of the other. The present situation demands a greater focus on improving the long-neglected operating environment.

Nevertheless, a certain amount of effort has gone into attempting to mitigate and contain these factors. Debris mitigation guidelines, codes of conduct, and other principles have been intermittently issued by a number of bodies like Russia's Roskosmos, America's NASA, Europe's ESA, and others. Ever since 1994, when the term "space debris" first appeared on the agenda of the Scientific and Technical Subcommittee (STSC) of the UN Committee on the Peaceful Uses of Outer Space (COPUOS), the matter has undergone numerous deliberations, draft instruments, and reports at the United Nations, finally culminating in the Inter-Agency Space Debris Coordination Committee (IADC) mitigation guidelines. However, enforcing, implementing, or enabling adoption of these guidelines would again be a moot issue.[8]

Secondly, the IADC is an international forum of governmental bodies aimed primarily at coordinating the debris-related activities of national space agencies. Most government-sponsored space activities already incorporate regulatory mechanisms to limit debris or are in the process of adopting mitigation measures; however, the same cannot be said of non-governmental bodies. In the present changed circumstances, the forum would have to expand to include the wide variety of existing and potential non-governmental players in space.

Additionally, certain debris mitigation solutions like boosting and parking non-operational geostationary Earth orbit (GEO) satellites at least 300 km above the geosynchronous orbital ring into graveyard orbits would at best provide temporary respite. Better, long-lasting alternatives need to be explored and worked on in the present to ensure future use of outer space in its entirety, rather than focusing only on the commercially and militarily useful GEO and low-Earth orbit (LEO) slots. Vast swathes of outer space are yet to be explored or understood fully for scientific and developmental applications. It is hence essential to exercise caution before prematurely arriving at conclusions on what areas are useful and useless in space.

Options to reduce launch rates without compromising state and non-state aspirations need to be mulled and worked upon. Cooperative multi-satellite launches on single vehicles by bodies with non-conflicting

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[8] [Editors' note: COPUOS adopted modified debris mitigation guidelines at its June 2007 meeting, after this paper was written.]

interests could be studied as an interim solution until reusable platforms or better alternatives appear. Mutually beneficial options for debris mitigation would be more workable than legislative endeavors aimed at imposing fault-based liabilities. The experience of the past decades indicate that in the global commons of space, verifying, implicating, and implementing penalties for transgressions is a complex issue. A carrot-based rather than stick-based approach would offer greater incentives to parties to take decisive action.

In addition to the quality of the operating environment of space degrading due to debris, increasing traffic congestion and a lack of a traffic management mechanism in space have also clearly increased the dangers of operation. It is imperative to put in place a traffic management system for regulating all three phases of launch, orbit, and re-entry. A reasonably effective system for regulating launch into space already exists; the other two are yet to be regulated in an acceptable manner. As in case of debris, a variety of proposals and studies aimed at resolving the issue have been undertaken or are in progress. Nevertheless, a comprehensive solution has not yet been reached for a variety of reasons. In some cases, proposals aimed at monitoring and regulating orbital traffic by space surveillance have run into difficulties on grounds of national security. These are largely related to the degree of confidentiality necessary for the data collected by space surveillance to be shared. Systems used for space surveillance and collision avoidance typically collect data that may enable precision targeting of space assets. National perceptions that such data so collected could be leaked, thereby compromising security, abound. Hence, not much headway has been made.

Efforts to institutionalize space traffic management activities within an International Civil Aviation Organization-kind of regulatory body are also in the offing.[9] Whether the same template applies in space as for civil aviation is debatable on account of the characteristic dual-use nature of space-based activities and other complexities. Nevertheless, some of the practices and procedures in the aviation sector may have applications for regulating space traffic and promoting the safety of operations in space. For instance, aircraft locator beacons continuously transmit the positions of aircraft for collision avoidance, air traffic control, and airspace management. A similar system for spacecraft could be envisaged, wherein

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[9] Institutes like the International Association for Advancement of Space Safety have proposed an "ICAO for Space Safety." For details, see *Webwire*, "Conference Highlights Space Safety as a Global Concern" May 14, 2007 at: www.webwire.com/ViewPressRel.asp?aId=35982.

passive transponders continuously relay their orbital positions. Military spacecraft or other platforms that do not wish to do so could be equipped with active transponders that reveal their position only if the operators so desire. Such a system could allay fears of data on national space assets being leaked and security being compromised. The applicability of the above analogy may be contentious; what is not is that there exists a pool of analogous prescriptions to explore and draw upon for resolution of the issue.

It is likely to be some time before conflicting interests in the above two areas—of space debris and traffic management—are addressed for comprehensive solutions. In the meanwhile, it is imperative to explore solutions and share information, technology, and other relevant matter to redress naturally occurring threats in space like solar storms, asteroids, and other environmental hazards that are detrimental to every party's interests. In a similar genre are instances of satellite signal theft and piracy, which are on the rise. The consequences of such actions are at either ends of the concern spectrum. They could be largely inconsequential, in the case of fringe individuals up to mischief, or very serious, in the case of terrorist and such-like organizations misappropriating them.[10] Sharing know-how on such common insecurities that affect both space and terrestrial operations would go a long way toward building mutual trust. A greater interaction on these issues could be a precursor to later cooperation on more complex issues.

Lastly, there also exists a need to institutionalize efforts and institutions designed at pre-empting and forestalling future insecurities in space. For example, the environmental consequences of opening up space to day-to-day commerce and tourism would certainly be a cause of concern in the near future. Hence, measures to contain environmental degradation and insecurities on account of such activities would need to be put in place (or at least mulled upon) well in time. It makes immense sense to anticipate and prevent the malaise rather than attempting to cure it at a later stage when the problem is full-blown.

An increased focus on these unconventional issues doesn't automatically imply a reduced focus on conventional military issues,

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[10] For example, China in 2002 claimed that the extremist cult *Falun Gong* had jeopardized its national security by hijacking and severely interfering with Chinese television broadcasts. In a more recent instance in 2007, the Liberation Tigers of Tamil Elam (LTTE), a Sri Lankan-based extremist organization, pirated and employed empty transponder frequencies of Intelsat's *Satellite 12* for their terrorist broadcasts.

because national security concerns would continue to ensure adequate state attention on military aspects. At the same time, unlike in the Cold War era, when the primary stakeholders in space were the two contesting superpowers, the number and diversity of stakeholders in space today has undergone a drastic increase. The larger and more diverse number of interested parties would indicate a larger pool of intellectual, human, state, non-state, and other resources to commit and organize toward seeking solutions to common problems in space security. It is essential to expand the existing pool further to draw upon an even wider set of ideas.

WHAT'S IN IT FOR ASIA?

Affairs in the global commons of space affect everyone. They do so more in the present than ever before. They also affect the continent of Asia just as much as the rest of the globe—or perhaps even more. A safe and secure space environment to draw upon for development, disaster warning, relief and mitigation, and other applications is particularly crucial to Asia. This is especially so considering that the statistics for the last 30 years clearly show that Asia is the most disaster-afflicted region in the world, accounting for about 90 percent of all those affected by disasters, and more than 50 percent of the total deaths and economic losses.[11] It is also an established fact today that outer space has enormous scope for bettering human welfare as well as fostering civil development; Asia is in dire need of both. A lot is at stake. The largest lot of humanity resides in Asia, and it cannot afford to merely stand by and watch significant gains being frittered away on account of perceived insecurities. As a matter of fact, according to UN estimates, the Asian continent is home to over 4 billion of the total 6.7 billion people on Earth.[12] Vast numbers and masses of humanity are in critical need of the welfare and social development that space can facilitate. A variety of space capabilities ranging from communications, telemedicine, education, hydrology, and others are yet to reach them and hence it is imperative that Asia also joins the quest to explore solutions for "secure and sustainable access to and use of space; and freedom from space-based threats."

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[11] Asian Disaster Reduction Center, "Natural Disaster Data Book-2005," available at: http://www.adrc.or.jp/publications/databook/databook_2005_eng/eng.html.

[12] See report of UN Department of Economic and Social Affairs, Population Division, "World Population Prospects: The 2006 Revision," UN, New York, 2007, Chapter 1, p. 17.

AN AUSTRALIAN PERSPECTIVE ON SPACE SECURITY

Brett Biddington

Space, in all its manifestations, presents a set of truly global questions. How these questions are asked and answered has the potential to determine the future of nations, societies, and possibly the very existence of life on Earth. This Australian perspective on the matter serves as the only representation from the Southern hemisphere in this volume.

In developing an internationally acceptable approach to space security, it may be instructive to first discuss the relationship in 1941 of Japan's Ambassador to Australia Tatsuo Kawai with Australia's wartime Prime Minister John Curtin and Foreign Minister Dr. H.V. Evatt. Ambassador Kawai presented his credentials in Canberra on March 14, 1941.[1] He established a personal relationship with Curtin and Evatt during the eight-month period between his arrival and the December 1941 coordinated attacks on Malaya, Thailand, Hong Kong, the Philippines, and the United States. As part of a negotiated exchange, he returned to Japan on August 16, 1942. During these 17 months, the three worked together to try to find a way to peace. Kawai and Curtin trusted each other and developed a personal friendship; their respective families maintained contact long after the death of Curtin in July 1945 and Kawai in October 1966.[2]

Curtain and Evatt understood clearly three critical points about the relationship between Australia and Japan: 1) that Australia was a sovereign nation that needed to shed its remaining colonial vestiges; 2) that Australia's long-term security lay with a close and enduring relationship with the United States as the emergent great power in the Pacific; and 3) that Japan had legitimate cause for complaint because it had been denied access to raw materials and markets.

There is a fine line to be drawn between appeasement and concessions that protect or advance a nation's interests. Curtin was

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[1] For background on this relationship, see Bob Wurth, *Saving Australia: Curtin's Secret Peace with Japan* (Melbourne: Lothian, 2006).

[2] Curtin's death in July of 1945 occurred only six weeks before the Japanese surrender.

thoroughly aware of Chamberlain's humiliation by Hitler and was careful not to make the same mistake in his dealings with Ambassador Kawai. It was a delicate dance based on pragmatism—not wishful thinking—personal trust, and respect.

The following timeline depicts the six months from December 1941 to June 1942, as Japanese forces spread rapidly across Indo-China, the Dutch East Indies, and the Pacific.

December 7, 1941	Pearl Harbor
February 15, 1942	Fall of Singapore
February 19, 1942	Darwin bombed for the first of 64 times
May 7-10, 1942	Battle of the Coral Sea
May 31, 1942	Midget submarine attack in Sydney Harbor: three Japanese boats, all lost; four bodies recovered; the remaining boat was recently discovered north of Sydney (now a designated war grave)
June 4, 1942	Battle of Midway

Japan did not recover from Midway, but it still took three more years of fighting before hostilities ceased.

The bodies of the four submariners recovered from the midget submarine raid on Sydney were accorded military funerals by Australia. The remains were cremated and the ashes returned to Japan in Ambassador Kawai's custody. The Japanese press acknowledged the essential decency accorded its dead submariners by its Australian enemy. This small act, which brought much praise later, can be attributed directly to the relationship between Curtin and Kawai.

This history is an essential component to Asian perspectives on acceptable approaches to collective security in space. Even in war, there can be cooperation. Even in war there can be trust, especially by leaders who are capable of taking the longer view. Wise leaders know that war will end and have enough foresight to direct the energies of some of their best and brightest to the future peace—its shape, its structure, and its capacity to endure. Acceptable approaches to collective security, whether in space or anywhere else, require:

- institutions to provide continuity and context;
- competent people, who have a healthy respect for each other and who have a sound appreciation of the other's point of view;

- opportunities for these people to meet in order that they can share experiences, talk about the mundane, and build trust;
- mechanisms for operational cooperation—"rules of the road," not unlike the Vienna or Hague Conventions, that are actually put into effect;
- real determination by national leaders, beyond their rhetoric, to collaborate and cooperate, and the flexibility to do so; and
- real projects that transcend national and other institutional boundaries and that provide opportunities to build friendships, trust, and related collaborative behaviors.

It seems to me that the world is coming to a quite complex junction with regard to space security. We need to think well beyond the metaphor of a "crossroads" to comprehend the issues that are starting to pile up.

AUSTRALIA'S ROLE IN SPACE: PAST, PRESENT, AND FUTURE

Before commenting on the challenges facing us, it is necessary to provide some context by briefly discussing Australia's involvement in space activities to date.

Australia has been involved with space since the late 1940s. In the 1950s and 1960s, it hosted British and European rocket launcher development programs and also allowed the British to conduct several nuclear tests on Australian soil. Australia was the fourth country to build and launch a satellite from its sovereign territory—*WRESAT* in 1967.[3] At about the same time as the United Kingdom and Europe left Woomera, the United States gained approval to locate several important ground stations on Australian soil to support U.S. national security and civilian missions. The television broadcast of Neil Armstrong's first steps on the Moon in 1969, for example, was routed from the Moon to the United States through antennas in Australia.

Australia provided real estate and modest investment in order to take advantage, for national security reasons, of the information that these systems provided. The so-called Joint Defence facilities, notably Pine Gap near Alice Springs, are regarded as jewels in the crown of Australia's relationship with the United States. The U.S. alliance is the basis of Australia's national strategy. In other words, there is an implicit space

[3] *WRESAT* was named after the organization that built the satellite, the Weapons Research Establishment.

component at the heart of Australia's national strategy and national security policy.

The central importance of the space component to Australia's national strategy is poorly understood by most Australians, including the space community.[4] These groups indeed feel dispossessed, unappreciated, and essentially let down by the government. As the secrecy surrounding the U.S. missions and capabilities being supported by Australia has been reduced since the end of the Cold War, and as "dual use" technologies in space have become more common, the need for Australia to "re-baseline" its national space strategy has begun to emerge.

Australia has benefited enormously from access to data in the national security domain that it could not have afforded to obtain by its own means. It also has been the beneficiary of data from the Earth observation satellites owned and operated by other nations for weather and climate data, mineral exploration, and land and ocean management. This dependence on data provided by others is a frequent source of criticism within and outside of Australia. But the question must be asked: "Why should a small nation in population and GDP terms[5] assume technology and risks at potentially considerable cost, when, to this point at least, there has been no compelling need to do so?" Australia, for the price of wise diplomacy, peppercorn rentals, and modest investment, has gained enormous benefits from space. While this approach may have sufficed to date, it is not an approach that is going to work in the future.

THE MOST PRESSING CHALLENGES

With respect to space security, specifically, and the future of space activities, in general, the following seem to me to be the most pressing issues.

MILITARIZATION AND WEAPONIZATION

Australia is an actor in this discussion because it has national capabilities and hosts others that contribute routinely to the global surveillance network, which is the basis for ballistic missile early warning. Australia has developed and now operates the world's most-capable, high-

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[4] The space community is defined here as those interests embracing space science, commercial, and civil space activities, the space industry (such as it is), and the amateur enthusiast community.

[5] Australia contributes two percent of the world's wealth.

frequency, over-the-horizon radar network. This system is relevant to missile defense. Australia has announced that it proposes to buy three air warfare destroyers over the next decade. These ships will be fitted with the Aegis radar system and eventually will also be fitted with a weapon that can intercept other missiles. Almost certainly, the Australian systems will be tightly integrated into U.S. space-based systems and possibly also with the forces of other regional nations.

In the event that the United States, China, Russia, or any other nation determines that its national interests are best served by placing weapons in space, Australia may have a preference for it not to happen, but it will also have no great influence over the result. Almost certainly, Australia would agree to any U.S. request to place ground-based elements for such a system on Australian soil, should operational requirements dictate it.

SPECTRUM ALLOCATION AND MANAGEMENT

The Information and Communications Technology (ICT) revolution of the past 20 years continues to place increased pressure on the electro-magnetic spectrum, including those frequencies that are critical for space communications. These very same frequencies are sought by governments for military and national security uses and also by the mobile phone/radio telephony market.

Particular problems occur with spectrum allocations that cross national boundaries, which occur, by definition, with satellites, aircraft, and global marine systems. The International Telecommunications Union (ITU) may be a venerable institution, but its mechanisms are slow—typically four to eight years for decisions on matters relevant to space communications. The technology cycle is much faster than this and a point in time can be anticipated where companies and governments will simply begin to ignore the ITU.

SERVICE GUARANTEES IN AN IMPERFECT MARKET FOR HIGHLY ASSURED ACCESS TO SPACE UTILITIES

Although the question of weaponization may be the most urgent question that space policy-makers think they face, it may not be the most important. In the face of climate change and global warming, the need for new investments in a suite of sensors capable of increasing the predictive accuracy of both climate and weather models would seem to be imperatives of global as well as regional, national, and sub-national importance. All

countries in Southeast Asia and Oceania have a vital interest in the impacts of climate change, and Earth observation from space is going to play an important part in understanding what is happening.

Australia's experience in the governance of Antarctica may be relevant and helpful in bringing together regional views. There are many parallels between how the governments of the world approach Antarctica and how we should approach space. The sovereign claims in Antarctica are "frozen," and the continent has essentially been given over to fundamental science that is meant to benefit all of humankind. On the ice, there is enormous practical cooperation between those who live and work at the various bases—especially in matters of safety, life, and death. This is not dissimilar to the cooperative activities that Russia and the United States pursued in space during the Cold War, more or less in parallel with their competitive activities. There is a fascinating duality here in policy and practice.

As the world grapples with questions about increased military uses of space and the prospect of weaponization, it is worth reflecting on the sorts of arrangements and understandings that exist and through which Antarctica has been managed for the past 50 years. Essentially a balance has been struck between sovereign interests and the broader interests of humankind.

Australia sits at the heart of the Antarctic Treaty. Australia claims about two-thirds of the Antarctic continent as sovereign territory and is the pivot around which the large and medium powers and the smaller countries with interests in Antarctica revolve. It is fair to say that Australia is seen as an honest broker between the various interested parties. Perhaps this is a role that Australia could extend into the domain of space.

MONITORING AND MANAGING THE NEAR-SPACE ENVIRONMENT

Space debris, especially out to about 40,000 km from Earth, is a serious problem. Conscious efforts are being made to reduce the amount of new debris being created, and efforts are also being made to reduce the amount of debris that exists. The problem is going to be with us for a long time.

Space surveillance and space situational awareness would seem to be areas ripe for international cooperation. This is also an area where a clear opportunity exists for Australia to both to invest in capability and show leadership. In this regard, there is a project to put a 2.4-meter optical telescope at a place called Dome C, which is high on the plateau in

Antarctica. This telescope could make a very useful contribution to space debris discovery, characterization and calibration. But will this be enough?

IMPLICATIONS OF THE CHINESE ASAT TEST

On January 11, 2007, the Chinese conducted their much-discussed ASAT test. A week after the test, the Australian Government called in Chinese Ambassador Madame Fu and demanded an explanation for China's actions.[6] Three questions come to mind.

First, why did Australia call in the Chinese ambassador at all? Was there a vital national interest that the government was keen to protect, or was the objection based on idealistic, whole-Earth environmental grounds?

Second, what did Australia seek to achieve by calling in the Chinese ambassador? Officially, Australia sought an explanation about the nature of the incident and an assessment of the danger posed by the debris created by the incident. Australia also sought an explanation of China's future plans for developing and deploying space weapons. Taking a longer view, the question that arises is whether Australia sought to change Chinese behavior in the future (i.e., prevent further similar tests) in order to gain political points in Washington or elsewhere, or to gain applause from at least that part of the Australian electorate that worries about the environment, including the space environment?

Third, how did Australia propose to measure the impact of its expression of displeasure? Turning this around, there are some further questions. What did the ambassador write to Beijing in her account of the meeting with Australian officials? No doubt she reported the conversation accurately, but the more important part of the cable would have been in the assessment paragraphs. Did she conclude that Australia, as a friendly neighbor with legitimate space equities, had made a series of points to be taken seriously in Beijing, or that Australia has acted as a puppet of the United States and so could be ignored, or that the motives for Australian interest in the matter were unfathomable? Has Chinese policy and behavior been influenced one iota by the ambassador having been called in? If so, how? If not, why not? As a result of the ambassador's dressing down, is China more or less likely to conduct further ASAT tests?

From the point of view of the Chinese ambassador, it is understandable that she was puzzled by Australia's early and somewhat strident intervention. The episode only makes sense when the national

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[6] "Canberra Tackles China on Space War," *Sydney Morning Herald*, January 20, 2007.

security dimension is added. And then the question remains whether Australia has sufficient stake to be taken seriously in matters of global space policy and space diplomacy.

For any government to be taken seriously in any of the world's counsels about space, there is a minimum requirement for that government to own and operate its own satellites for operational reasons tied to enduring national interests. Experimental satellites provide neither a necessary nor sufficient stake. The country does not need to have an independent launch or satellite manufacturing capability, although such capabilities help to build credibility. The satellites must not be "one-offs," but rather part of a program for communications or Earth or space observation that is perceived to be ongoing and therefore demanding of long term institutional support.

In policy domains other than space, Australia has played the role of "honest broker" as a small-to-middle-range power. It is not clear whether other countries, both in the region and more widely, see Australia as having something similar to offer as we look to the future of space.

THE BREEZE OF CHANGE

In addition to the missile defense capabilities mentioned earlier, some years ago the Australian Department of Defence (DoD) purchased a half share in the *Optus C1D* communications satellite. Basically one-half of the payload is used for commercial communications and the other half is dedicated to military communications in support of the Australian Defence Force (ADF). Recently, a second space office was set up in the Defence headquarters in Canberra. Although this may look inefficient, the number of officials (uniformed and civilian) with explicit responsibilities for space matters with the Australian DoD has doubled. A glance at the unclassified 10-year investment plan for the ADF reveals that Defence plans to spend some billions of dollars on space-based or space-enabled capabilities in the next decade. Indeed the ADF's new approach to warfighting, known as Network Centric Warfare (along U.S. lines), makes evident that space capabilities for communications and information gathering are necessary components of the emerging warfighting approach.

In short, Australia, in addition to extending its historical reliance on the capabilities of others, is now investing and reinvesting in capabilities of its own: initially in defense and security. There is similar growth in the civil and commercial domains.

The southern parts of Australia, where most of the population lives, are in the grips of a serious drought. Whether this is the result of human

induced global warming or the result of a more or less natural cycle continues to be discussed. Whatever the answer, the government has announced a $10-billion (Australian) water plan in an effort to comprehend and then remediate the problem. There is no doubt that space-based weather monitoring, optimized for the Australian continent and its immediate environs, will be an essential element of this plan. The water crisis is of such dimension that the point is close upon us, some would say has been reached, where it is no longer acceptable to rely on data which is produced essentially as a by-product for systems optimized for observing weather over parts of the Northern hemisphere.

Jumping ahead, one suspects that Australia within the next decade will invest in its own geo-stationary Earth observation satellite located somewhere north of New Guinea that will be optimized to measure precipitation. This may be supplemented by one or two low-Earth orbiting satellites optimized to measure soil moisture content. The most difficult questions that will need to be resolved if these capabilities are to be realized, have little to do with cost or technology. They have everything to do with leadership, organization, and governance.

Two years ago, Senator Grant Chapman (Liberal, South Australia) set up a Space Policy Advisory Group (SPAG), which drafted on his behalf a short report called "Space: A Priority for Australia."[7] This report demonstrated Australia's dependence on space for all sorts of services and argued that dependence leads to vulnerabilities, which leads in turn to risks. The report went on to suggest that the Commonwealth Government has no effective way of comprehending or measuring the risks identified, let alone thinking about how to mitigate them. The report recommended that a small space policy coordination office be established in the prime minister's own department to pull together the classified national security equities with the unclassified economic and environmental security equities, as well as the interests of space science and astronomy. So far, there has been no formal response.[8]

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[7] Chapman, G., "Space: A Priority for Australia," the Australian Senate, Canberra, 2005.

[8] Since this paper was first drafted was given, a response has been provided to Senator Chapman by the Minister for Industry. The response reiterates the current position and asserts there is no need to alter the current arrangements. The larger strategic questions raised by Senator Chapman were simply ignored in the minister's reply.

However, a Canberra think tank, the Kokoda Foundation,[9] has taken up the baton. In 2006, it commissioned a study into Australia's space future, looking towards 2025. Questions of cooperation and competition in space are at the heart of the study. The report is being finalized. It will renew the call for a centralized policy coordination mechanism—not a space agency. The report will also advocate the need for Australia to make a national investment in space assets in order to then play the role, so often played in the past, as honest broker between the big and the small, the bellicose and the timid.

Certainly there will be a regional component to this diplomacy, but the real work to be done is with the United States, China, and Russia in the first tier, with India, Europe, and Japan in the second tier, and a plethora of countries with various sorts of space ambitions and interests in lower tiers. New arrangements for achieving a degree of order and predictability in space may need to go hand in glove with much more ambitious reforms, such as reform of the United Nations system generally and the Security Council in particular. Indeed, space could be put forward as the subject matter around which the institutional reform agenda could be cast.

Changing technologies, in particular the proliferation of dual-use technologies, and new entrants into space, present fundamental challenges to the old order. If Australia continues to pursue its current policy of taking what it can get more or less for free, it will, in effect, abrogate any thought it may have to exert appropriate influence, as it has done in the past, in important international affairs.

Finally, Australia will have to demonstrate to the region that its alliance relationship with the United States is not one of uncritical subservience or obeisance but rather is characterized by independent thought and, where appropriate, disagreement and critique.

On hearing the news of Pearl Harbor on Monday, December 8, 1941, John Curtin told his War Cabinet, "Now only the stars are neutral." Only days before, Ambassador Kawai tipped the Japanese hand and told Curtin, "I'm afraid it has gone too far; the momentum is too great." Space has been the high ground of diplomacy since just slightly more than 10 years after the end of World War II. We must do all in our power to ensure such phrases are never uttered by any future leaders with regard to space as we work to figure out what constitutes responsible and acceptable behavior in the environment that embraces us all.

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[9] See: www.kokodafoundation.org.

U.S. PLANS FOR SPACE SECURITY

Joan Johnson-Freese[1]

Consideration of U.S. plans for achieving space security, especially within the context of an Asian perspective, is a timely topic given both the issuance of a new U.S. National Space Policy (NSP) in 2006 and the Chinese anti-satellite (ASAT) weapon test in 2007. Multiple countries in Asia have space programs, ranging from fledgling to mature, and the United States has worked with many of them in both the civil and military space arenas. However, it is China and the United States that have been engaged in a dangerous spiral of action-reaction space planning and/or activity, and it is from this vantage point, first and foremost, that U.S. plans for space security must be considered.

In the new NSP, the United States justifiably asserts its intent to protect its space assets. Unfortunately, because of sometimes heavy-handed and ambiguous language that seems to claim exclusive American rights in space, the tone of the NSP at times overpowers the substance. The NSP also strongly implies that the way to protect valuable U.S. space technology is with more space technology, which could easily be construed as referring to space weapons. The notion that space technology can be made invulnerable, however, was largely dispelled by the Chinese in January 2007.

China's successful interception of its own defunct weather satellite proves that Beijing now has the ability to reach into space and destroy objects in low-Earth orbit (LEO), including America's high-resolution reconnaissance satellites. Some technical experts feel "the weapons system was used against a satellite that was much harder to hit than more strategically important satellites such as communications and early warning satellites in geostationary orbits."[2] So, China could have the capability to target an even larger number of valuable assets than originally considered.

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[1] The views expressed in this article are the author's alone and do not represent the official position of the Department of the Navy, the Department of Defense, or the U.S. government.

[2] Geoffrey Forden, "Evaluation of the Chinese ASAT Test," *Jane's Intelligence Review* (March 2007).

Only the United States and the Soviet Union have previously managed to demonstrate an ASAT capability. The last previous destructive ASAT test was in September 1985, when the U.S. Air Force launched a multistage rocket from an F-15A fighter plane which, in turn, fired a projectile that intercepted a defunct U.S. astrophysics satellite. That program was cancelled largely due to concerns that debris created from further tests would damage other satellites. Destroying a satellite in orbit creates enormous amounts of debris, and even small fragments of wreckage can cripple satellites in surrounding orbits. Satellites cannot normally be shielded against debris larger than 1 centimeter and pieces as small as 1 millimeter, traveling at high speeds, can cause catastrophic damage. The debris from that 1985 test took 17 years to re-enter the Earth's atmosphere. Since the United States has the most assets in orbit, it is U.S. spacecraft that are the most vulnerable to debris damage.

Many nations were understandably alarmed by China's action. Australia, Canada, the United States, Britain, Japan, and South Korea were among those voicing concern and protest. Due to improvements in space surveillance, a much greater volume of trackable debris has been revealed following the 2007 Chinese ASAT test than the 1985 U.S. test. According to the Union of Concerned Scientists:

> By late March, the U.S. Space Surveillance Network had already cataloged more than 1,000 pieces of debris (presumably larger than 5 to 10 cm) from the Chinese test. Since the debris from this test is concentrated at altitudes near 850 km, it would double the density of debris larger than 1 cm in that region for at least five years.[3]

Beyond the dangerous space debris created by the Chinese test is the potential damage to U.S.-China space relations.

U.S. policy, at its most benevolent, has ignored China as a space-faring nation. At its most combative, it has considered virtually everything China does in space as having military intent nefariously aimed at the United States. The Chinese ASAT test effectively froze if not invalidated recent steps toward cooperation between the United States and China, such as NASA Administrator Michael Griffin's trip to China in September 2006.

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[3] "Debris From China's Kinetic Energy ASAT Test," March 23, 2007, available on the website of the Union of Concerned Scientists at: http://www.ucsusa.org/global_security/space_weapons/debris-from-chinas-asat-test.html.

Immediately following the January ASAT test, Peter Brookes, who serves on the influential congressional U.S.-China Economic and Security Review Commission, wrote in an editorial: "Facing this new challenge, the United States should continue to deflect regular Chinese advances for cooperation with NASA."[4] While that outcome would, I believe, be counterproductive for the United States in the long-term, succumbing to the urge to match one reckless saber-rattling undertaking with another would be even worse.

This paper first examines the central documents underlying the Bush administration's space security policy. It then considers how the concepts embodied in these documents have been applied to space relations with China. Finally, it considers the sagacity of these policies and discusses possible means of crafting a more effective U.S. strategy.

SPACE SECURITY: A U.S. PERSPECTIVE

Between 1998 and 2001, Congress chartered three high-level independent commissions dealing with space. The first of these was the Commission to Assess the Ballistic Missile Threat to the United States, also known as the Rumsfeld Commission, after its chair, Donald Rumsfeld. The second was the Commission on U.S. National Security and Military/Commercial Concerns with the People's Republic of China, also known as the Cox Commission after its chair, then-California Congressman (Republican) Christopher Cox. The third was the Commission to Assess U.S. National Security Space Management and Organization, known as the Rumsfeld Space Commission. Together, the findings of these three commissions have shaped current U.S. space policy.

The first Rumsfeld Commission operated on a short six-month mandate, beginning its work in January 1998 and issuing its final report in July 1998. Support for a national missile defense system, strongly supported by a Republican Congress and administration officials dating back to the Reagan administration, was blunted first by the fall of the Soviet Union and then the 1995 National Intelligence Estimate (NIE) which said no country beyond the five major nuclear powers would be capable of acquiring missiles capable of reaching the United States within 15 years. The Rumsfeld Commission was basically created to challenge those findings and, tacitly, identify a rational for missile defense. While the commission never addressed the viability or need for a national missile

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[4] Peter Brookes, "China's Wake-Up Call in Space Race," *China Post*, January 23, 2007.

defense system, its findings were seen as support for such weapons, to the alarm and dismay of some of its more moderate commissioners.[5]

Using what has been referred to as a hypothesis-based threat assessment, the report criticized the intelligence estimate for focusing on what was actually occurring, rather than what could possibly happen. In the 1998 Rumsfeld Commission report, rather than looking at what was occurring or what was *probable*, what was *possible* was the standard employed. Additionally, the Commission expanded the standard definition of what range capability constituted an intercontinental ballistic missile (ICBM) rather than an intermediate-range ballistic missile (IRBM), immediately increasing the number of ICBMs threatening the United States, though the aggregate number of missiles did not change. The report also stated that the United Stated was threatened or potentially threatened by weapons of mass destruction from China, Russia, Iran, Iraq, and North Korea. The short time mandate of the commission necessarily left areas some commissioners saw as interesting unexplored. They were not, however, stopped from suggesting that others pick up on those areas.

The Cox Commission was the creation of Republican Speaker of the House Newt Gingrich. Its charter ran from July 1998 to December 1999.[6] The Cox Committee was charged with looking into two problems: allegations of technology theft at the national laboratories, resulting in the arrest of Dr. Wen Ho Lee; and whether U.S. technology had been illegally transferred to China consequent to a 1996 satellite launch accident in China. While the commission got off to a somewhat slow start, after Donald Rumsfeld testified in October 1998, its investigation vigorously focused on allegations of Chinese theft and espionage as means to upgrade their missile program. The report was a 1,000-page, five-volume glossy covered set. Unfortunately, many analysts felt that the findings were as superficial as the cover.[7] According to the report, American nuclear weapons designs were jeopardized, Chinese missile capabilities were improved, and American security basically was hanging on by a thread.[8]

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[5] Richard L. Garwin, "Keeping Enemy Missiles at Bay," *The New York Times*, July 28, 1998.

[6] For further information on the Cox Report, see Joan Johnson-Freese, *Space as a Strategic Asset* (New York: Columbia University Press, 2007), pp. 153-158.

[7] Tom Plate, "Cox Report was 'An Exercise in Amateur-Hour Paranoia," *Los Angeles Times*, July 21, 1999, p. B7. See also: Jonathan Pollack, "The Cox Report's 'Dirty Little Secret'," *Arms Control Today* (April/May 1999).

[8] Andrea Mitchell, interviewing Christopher Cox for the evening news, asked the kind of nebulous yet frightening question that became typical of the media

After the 2000 election, the near-panic over space-related national security concerns vanished. Those who had most loudly shouted that the "sky was falling" quickly disavowed involvement and called for efforts to unravel the mess created by Cox Committee's recommendations. While the intent of those recommendations had been to tighten export controls on China and isolate China's space program, in effect they exacerbated already complicated U.S. export regulations for all countries and in many cases merely drove aerospace buyers, including China, to willing sellers elsewhere.

The Rumsfeld Space Commission had its first meeting in July 2000 and concluded its deliberations in December 2000. The commission report, issued in January 2001, adopted a fundamental premise that the United States depends more on space-based assets than does any other nation and that the value of those assets will only grow. It drew some far-reaching conclusions from that premise. It stated, for example, that since land, air and the seas have all become battlefields, it is inevitable that space will as well, observing:

> …we know from history that every medium—air, land, and sea—has seen conflict. Reality indicates that space will be no different. Given this virtual certainty, the U.S. must develop the means to deter and to defend against hostile acts in and from space. This will require superior space capabilities. Thus far, the broad outline of U.S. national space policy is sound, but the U.S. has not yet taken the steps to develop the needed capabilities and to maintain and ensure continuing superiority.

It also planted the seed of extending deterrent concepts and defense capabilities beyond the Earth's atmosphere, ideas later germinated in the 2002 National Security Strategy (NSS). Moreover, the report challenged the notion of international law as a tool for providing space security.[9]

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coverage of the Cox Report. "Congressman, do you sleep a little more uneasily at night as a result of all that you know now?" NBC Nightly News, May 21, 1999.

[9] See Sam Black, "The Rhetoric of the Rumsfeld Space Commission," Center for Defense Information, January 24, 2007, available at: http://www.cdi.org/program/issue/document.cfm?DocumentID=3816&IssueID=76&StartRow=1&ListRows=10&appendURL=&Orderby=DateLastUpdated&ProgramID=68&issueID=76.

The Space Commission Report specifically laid down the premise that international regulations are bad for the United States, serving only to restrict U.S. activity. However, it was also somewhat contradictory of itself, in that it advocated the fashioning of "rules of the road" for space among "U.S. allies and friends, and the international community."[10] It was unclear, though, how "rules of the road" would differ from international regulations.

If one accepts the premises of the Space Commission—particularly that space will inevitably become a battlefield—then the United States would be remiss not to prepare for that inevitability. The Joint Doctrine for Space Operations, published by the Office of the Joint Chiefs of Staff in August 2002, accordingly, states that "The United States must be able to protect its space assets and deny the use of space assets by its adversaries." Similarly, the 2004 U.S. Air Force Counterspace Operations Doctrine document states that "US Air Force counterspace operations are the ways and means by which the Air Force achieves and maintains space superiority. Space superiority provides freedom to attack as well as freedom from attack." In June 2006, John Mohanco, Deputy Director of Multilateral Nuclear Security Affairs at the State Department stated to the Conference on Disarmament that:

> The high value of space systems for commerce and in support of military operations—long has led the United States to study the potential of space-related weapons to protect our satellites from potential future attacks, whether from the surface or from other spacecraft. As long as the potential for such attacks remains, our Government will continue to consider the possible role that space-related weapons may play in protecting our assets.

While the U.S. Air Force is the "executive agent" for space—owning and operating the bulk of U.S. military space assets—the mission of U.S. Strategic Command (STRATCOM) is to provide "integrated Space and Global Strike capabilities to deter and dissuade aggressors and when directed, defeat adversaries through decisive joint global effects in support

[10] Report of the Commission to Assess U.S. National Security Space Policy, January 11, 2001, pp. 17-18.

of USSTRATCOM global missions,"[11] clearly reflecting the Space Commission's and the NSS's "deterrent" goals.

The connectivity between these commissions is important. Four of the seven core staff of the first Rumsfeld Commission went on to work for the Cox Commission. At least one staff member was on all three commissions. The "heavy hitters" on the staff of each are also noteworthy: Steve Cambone, former U.S. undersecretary of defense for intelligence (a position that was created specifically for him) was the staff director for both of the Rumsfeld Commissions and I. Lewis "Scooter" Libby, later to serve as Vice-President Dick Cheney's chief of staff,[12] served as legal counsel to the Cox Commission. These individuals had direct access to, or they were part of, the inner circle of the Bush administration. There is no doubt that the commission reports significantly influenced and served as the basis of administration policy.

THE 2006 NATIONAL SPACE POLICY (NSP)[13]

On first reading, the new U.S. NSP looks much like the Clinton administration's policy enunciated a decade ago. Supporters of the Bush policy, in fact, state that it is little different, except that the language is perhaps a bit less diplomatic. Upon closer examination, however, and, more importantly, in the context of the commission reports just discussed, the 2002 and 2006 NSS documents, and actions taken by the United States since 9/11, the changes are dramatic. They are also ambiguous and sometimes inconsistent with already existing policies and programs, revealing a kind of incoherence and disingenuousness—and militancy—about U.S. space policy in the 21st century.

First and foremost, the Bush administration's policy enunciates a U.S. space program that is focused mainly on security. While this makes obvious sense, the blunt and even confrontational language of the new policy puts the United States at odds with the priorities of many other space-faring nations. For most countries, space assets are primarily considered as crucial tools of globalization, essential for building the

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[11] See the mission statement of STRATCOM on its website at: http://www.stratcom.mil/fact_sheets/fact_sgs.html.

[12] Libby was later convicted of four felony charges relating to the exposure of U.S. intelligence operative Valerie Plame.

[13] Parts of this discussion are from Joan Johnson-Freese, "The 2006 National Space Policy: A New Turn Toward Militancy?" *Issues in Science & Technology* (Winter 2006).

knowledge-based societies seen as key to success in the 21st century. In Europe, for example, the March 2000 meeting of the European Council set a new and ambitious goal for the European Union: to become, by 2010, "the most competitive and dynamic knowledge-based economy in the world."[14] Similarly, Indian President A.P.J. Abdul Kalam has long stressed the importance of creating a "knowledge-based society," which in turn would help India update and reinforce its strengths in the industrial and agricultural sectors,[15] a perspective that has translated into multiple space-related initiatives by the Indian government. Similar espousals of support for building knowledge-based societies and consequent government initiatives can be found in almost all countries.

To be fair, the new U.S. policy recognizes that "those who effectively utilize space will enjoy added prosperity and security and will hold a substantial advantage over those who do not." Unfortunately, whether utilization is therefore to be encouraged as a road to security, and if it is, how, is not fleshed out. Instead, the rest of the document emphasizes the military uses of space, rendering this almost a throw-away line. "Freedom of action in space," the authors write, "is as important to the United States as air power and sea power." While inherently true, the question left unanswered is whether that means that other countries can then demand similar rights and expectations regarding their security in space as well. To assert a right in the international community is to assume that others can assert a similar right as well. We should consider this language from the new space policy as well: "The United States rejects any claims to sovereignty by any nation over outer space or celestial bodies, or any portion thereof, and rejects any limitations on the fundamental rights of the United States to operate in and acquire data from space." Again, the language begs an important question: if the United States can claim complete freedom to operate in space, does this right then extend to every other nation on Earth as well?

A key principle in the new policy states: "The United States considers space systems to have the rights of passage through and operations in space without interference. Consistent with this principle, the United States will view the purposeful interference with its space systems as an infringement on its rights." In other words, the United States

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[14] See the European Council's website at: http://ec.europa.eu/employment_social/knowledge_society/index_en.htm; see also: "Presidency Conclusions,: Lisbon European Council, March 23-24, 2000.

[15] "Create Society Based on Knowledge, says President," *The Hindu*, December 12, 2002.

considers space to be something like the high seas. And yet, when it is in America's national interest, the United States acts against vessels in the maritime commons (when it—rightly—inspects ships carrying suspected North Korean contraband). But does such an absolute declaration of sovereign right really help the cause of cooperation in space? Even on Earth, the high seas are not immune to international governance; why should space be any different?

In response to questions from the press and in related public statements at the United Nations and elsewhere, the administration does clarify that this right of passage applies to all nations, not just the United States. However, the United States is emphatic that the rights it enunciates cannot and will not be guaranteed by international law but by the threat of force, thereby providing a rationale for development of new capabilities. Additionally, in other parts of the document, the passage on right of access is apparently superseded, or contradicted, by other policy priorities.

The Times of London perhaps summed up the international perspective toward the new American NSP best, in its October 19, 2006 article entitled "America Wants it All—Life, the Universe, and Everything," where it stated that Washington no longer viewed space as the final frontier, but instead as the "51st state." It went on to say that, "The new National Space Policy that President Bush has signed is comically proprietary in tone about the US's right to control access to the rest of the solar system." While this statement may well be wrong, depending on how ambiguous passages are interpreted and policy contradictions reconciled, its importance lies in the perception of U.S. intent.

CHINA AND THE UNITED STATES: A CLASH OF AMBITIONS?

The view of the heavens from Beijing and the view of the heavens from Washington are very different. From Beijing, the view is largely obscured by U.S. assets, assets still rapidly expanding in number, type and potential lethality. From Washington, the space assets that facilitate a strong and dynamic U.S. economy and the most powerful military in the world were placed in jeopardy on January 11, 2007, with the successful Chinese ASAT test.

Washington is aware of the official aims, principles and accomplishments expounded in the White Papers on space that China's Information Office of the State Council issued in November 2000 and October 2006. Nevertheless, given that 95 percent of space technology is dual-use, and that Chinese space activities of late have ranged from manned spaceflight to ASAT testing, and that space is an inherently expensive area

of development, the question of China's pragmatic intentions in space has become a subject of scrutiny worldwide, particularly in the United States. China shares the views of many other countries, including many European countries and Japan and India, that investments in dual-use technology are desirable in that the rate of return on such investments tends to be very high. But there are many people in the United States who believe that China is exploiting the dual-use nature of space technology to develop asymmetric military challenges to the United States.

U.S. policy toward China regarding space became explicitly negative as a result of the 1999 Cox Committee Report. That report, however, was only one of several actions taken by the United States that indicated Chinese space activities were viewed as suspicious, if not nefarious. Discussions of the Chinese term *Shashoujian*, the Assassin's Mace or "silver bullet" approach, were frequently found in the context of deciphering Chinese space intentions. While a common term that can be employed across a wide range of topics to indicate "providing an edge,"[16] in the 2002 report of the U.S.-China Security Review Commission it was first used[17] to imply development of a mysterious and exotic "silver bullet" to thwart U.S. space capabilities, and often used in that manner subsequently. The Schriever Space War Games between 2001 and 2005 were indicative of the Bush administration's harder line as well. In the first of those well-publicized war games, the scenario involved a large land opponent threatening a small island neighbor, a la Taiwan. Not allowing China as a partner on the *International Space Station* was another, as was China being largely excluded from NASA cooperative programs. While the rest of the world was increasingly embracing China as a partner in space activity, especially in the commercial realm, the United States increasingly viewed Chinese space activities as threatening.

One question that loomed large in U.S. policy circles was whether Chinese military space activity was primarily focused on keeping Taiwan from breaking away, or whether there were larger, more long-term goals supported by space. The overall conclusion has been that short-term goals for keeping Taiwan in the fold also support larger long-term goals for

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[16] Alastair Iain Johnston, "Toward Conceptualizing the Concept of Shashoujian (Assassin's Mace)," August 2002, available at: www.people.fas.harvard.edu/~johnston/shashoujian.pdf.

[17] Compilation of Hearings Held Before the U.S.-China Security Review Commission, CIS-NO: 2005-J891-17, CIS-DATE: 2001 CIS-DATE: 2005. The term was introduced to the commission through the testimony of Michael Pillsbury on August 3, 2001.

expanding Chinese power and influence. Space hardware of particular value in the context of potential hostilities with Taiwan, and, subsequently, the United States, fell into two basic categories: missiles and hardware to thwart advantages accruing to the United States by virtue of its own space assets.

While short-range missiles, such as the M9, could inflict significant damage on Taiwan, whether they could be decisive against the heavily fortified Taiwanese forces is unclear. Longer range missiles are another matter, as their primary purpose is considered as deterring U.S. interference with Chinese military actions. While long-range missiles in any arsenal are intended to serve as a "mutually assured destruction" type of deterrent, actual use would quickly escalate military activity far beyond Taiwan. So it is believed that if China were to try to "inhibit" U.S. involvement in a Taiwan conflict scenario, it would have to be very careful in how it proceeded so as not to escalate hostilities with the United States, which would be difficult at best. The Chinese anticipate that the United States could intervene in the event of a Chinese invasion of Taiwan in two ways: the U.S. could neutralize China's communications and reconnaissance satellites and the U.S. could place its space assets at Taiwan's disposal by sharing real-time intelligence and early warnings.[18] U.S. space assets clearly outnumber and outdistance Chinese assets, in terms of both infrastructure (such as launch sites and tracking stations) and satellites. Furthermore, the ability of the United States to "reconstitute," or replace, its space assets is far greater than that of China. While the Pentagon confirmed in 2006 that China had tested an ASAT laser capable of potentially "blinding" U.S. satellites and had engaged in electronic jamming against a U.S. satellite, there have been no allegations of damage-inflicting "attacks" on U.S. satellites. In fact, the commander of Strategic Command, General James Cartwright, stated that "the United States had not seen clear indications that China has intentionally disrupted American satellite capabilities."[19] Nevertheless, the January 2007 Chinese kinetic kill ASAT test certainly confirmed Chinese capabilities at least in that area, and there is concern that China is developing a wide range of ASAT capabilities.

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[18] B. Raman, "Anti-Satellite Capability—A Chinese Eye View, China Monitor," Paper Number 11, South Asia Analysis Group, January 23, 2007, available at: www.saag.org/\papers22/paper2107.html.

[19] Martin Sieff, "China has not attacked US satellites says DOD," *Space Daily*, October 25, 2006.

U.S. REACTION TO THE CHINESE ASAT TEST

While Chinese ASAT activities were ambiguous until recently, China's successful test of a ground-launched, hard-kill system made China's active capability for LEO satellite destruction clear. Previously a leading advocate along with Russia for a treaty banning space weapons, China's enigmatic move raised questions worldwide about its ultimate motivations. The technology used by China was strikingly similar to U.S. missile defense technology. The kinetic-kill vehicle (KKV) was likely boosted on a modified, two-stage DF-21 launcher. Reportedly, there were several prior tests of the system. After the 2007 interception, speculation in the United States is that the direct-ascent program is part of a larger Chinese ASAT program, including ground-based lasers, satellite jamming capabilities, and parasite micro-satellites. That China was virtually silent on the test for 12 days afterward and provided confused and uncoordinated messages to the international community (including a denial by the military) indicates, at best, a lack of clear communications strategy and likely a larger lack of internal coordination about the test. It is not unlikely that compartmentalization within Chinese institutions and bureaucracies, still rampant, played a part if the debacle as well, leaving the Foreign Ministry to twist in the wind when international protests began pouring in.

China's motivations for testing the system are being interpreted in the United States as multifaceted, including technical and political objectives.[20] If a country is developing a capability, sooner or later it must be tested—or it has little value. Also, the timing indicates that China likely wanted to demonstrate to the United States that dominating space through technology was not going to be as easy as implied in the U.S. NSP. The Chinese test seemed to destroy that implication.

There has been considerable discussion in the United States as to whether the Chinese ASAT test has or will trigger a space arms race. The U.S. government position has been consistent in denying the existence of any such arms race. U.S. Ambassador Christine Rocca told the 65-member Conference on Disarmament in Geneva on February 13, 2007: "Despite the anti-satellite test, we continue to believe that there is no arms race in space,

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[20] Phillip C. Saunders and Charles D. Lutes, "China's ASAT Test: Motivations and Implications," *INSS Space Report*, Institute for National Strategic Studies, National Defense University (June 2007); Eric Hagt, "ASAT Test Strategic Response," *China Security* (Winter 2007); Bao Shixiu, "Deterrence Revisited: Space," *China Security* (Winter 2007); and Theresa Hitchens, "Cold War in Space?" *China Security* (Winter 2007).

and therefore no problem for arms control to solve."[21] Using a kind of circular argument, the premise seems to be that if there is no space arms race, now or anticipated, then treaties are not needed to prevent one in the future.

There are some in the United States with a "bring it on" attitude toward a space arms race. These advocates seem to believe that the United States can outspend China, forcing the People's Republic into a spending race reminiscent of the Soviet Union's doomed attempt to compete with the Strategic Defense Initiative (SDI). But the analogy is flawed on several levels, not least of which is that the Soviet economy was teetering on the brink of collapse in the 1980s. But there is an even more important technological point: if the Chinese test proved anything, it is that space assets, by their nature, cannot be made technically invulnerable by *anyone*. Pursuing that illusion would be chokingly expensive and strategically futile.

Even before China's 2007 ASAT test, Jeff Kueter, president of the George Marshall Institute, had argued that China's efforts to blind U.S. satellites over the past several years should serve as a wake-up call to the American public and the national security establishment,[22] referencing the allegations in 2006 of Chinese "blinding" of U.S. satellites. He pointed out that space-based assets on which the military relies for intelligence, surveillance, reconnaissance, tactical warning and attack assessment, communications, navigation, and environmental monitoring were all vulnerable to attack. That vulnerability was vividly demonstrated in January 2007.

The U.S. and many foreign governments expressed concern and consternation regarding the Chinese ASAT test. Some U.S. lawmakers considered the test as an opportunity to point out the threat posed to U.S. space assets and the need for more action on the part of the United States to counter that threat. Republican Senator Jon Kyl from Arizona was among those legislators. Senator Kyl referred to the Chinese ASAT test as a "wake-up call" for lawmakers and made six recommendations for a proposed U.S. response to China[23]:

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[21] See the website of the Chinese mission to the United Nations, at: http://www.usmission.ch/Press2007/0213PAROS.html.

[22] Jeff Kueter, "The War in Space Has Already Begun," October 2006, available at: www.marshall.org/pdf/materials/459.pdf.

[23] Senator Jon Kyl, "China's Anti-Satellite Weapons and America's National Security," Heritage Foundation Lecture #990, delivered January 29, 2007.

1. Implement the proposals of the 2001 Space Commission [much of which dealt with management and organization since that was its focus].
2. Hold hearings to assure that the Chinese ASAT technology was not based on U.S. technology, shared or stolen.
3. Assure that the U.S. military has access to operationally responsive space—meaning, the ability to launch and activate quickly militarily useful satellites.
4. Provide immediate funding for the "Space-Based Test Bed," to include both kinetic and directed-energy components to destroy missiles in their boost phase.
5. Increase the budget for "space control" programs.
6. Make "space security" via military means a conservative priority again.

Many, though not all, of these recommendations focus on technology: working to develop unassailable U.S. space assets. If that approach is taken, then United States could end up in an arms race against itself.

As the Chinese test showed, other nations can and will access space for their own purposes. Further, if they feel threatened by U.S. space assets, they do not need to obtain parity with the United States to be effective. Rather, all they need to do is develop inexpensive ways to thwart U.S. advancements, which is both cheaper and easier than trying to become "unassailable." Admiral William Fallon, formerly the top U.S. military commander in the Pacific and now commander of U.S. armed forces in the Middle East, said that the U.S. should not be shocked at the Chinese ASAT test, arguing: "A nation is going to do what they think they need to do. They know that space is a very important place and those who have great capabilities in the military world have a great reliance on space."[24] His comments echoed earlier comments of Marine Corps General James Cartwright, the top U.S. officer for space operations.[25] But the suggestions offered by Senator Kyl represent only one approach for dealing with these potential threats. Within the U.S. political debate, there are other options being discussed that may be more effective and less likely to provoke hostile foreign counter-reactions.

First, the notion of improving U.S. reconstitution capabilities has relatively widespread support. Rapid reconstitution capabilities are valuable

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[24] "Fallon: U.S. 'Shouldn't Be Shocked' At Chinese Anti-Satellite Test," *Inside the Pentagon*, March 22, 2007, p. 1.

[25] "Cartwright: U.S. Needs Multifold Response to Chinese ASAT Test," *Inside the Pentagon*, March 15, 2007, p. 1.

not just in response to acts of aggression, but also because space is an inherently hostile environment and components and whole systems fail regardless of how well they are designed and built.

Second, learning to fight without satellites or reliance on space capabilities is another U.S. option. This alternative takes into account the significant risk that is inherently incurred by reliance on vulnerable technologies. Increasing capabilities in this regard reduces the risk of reliance considerably. Toward that goal, there would be a need for assessments of impact were space assets to become unavailable and the development of contingency plans, as well as wargaming of the outcomes.

Third, including arms control options rather than disregarding it off-hand, remains part of the possible U.S. toolbox. While formal treaties might be a bridge too far, consideration is being given to "codes of conduct" on space behavior. Notably, discussion on the value of a code of conduct was raised in the 2001 Rumsfeld Commission Report: "In order to extend its deterrence concepts and defense capabilities to space, the U.S. will require...engaging U.S. allies and friends, and the international community, in a sustained effort to fashion appropriate 'rules of the road' for space." Since then, the Henry L. Stimson Center has worked extensively on preliminary development of such rules,[26] and the idea has been increasingly endorsed by such notables as Democratic Representative Jane Harmon of California, numerous representatives at the 2007 Conference on Disarmament, David McGlade (CEO of Intelsat), and STRATCOM commander General James Cartwright. Additionally, the Chinese ASAT test perhaps also created the opportunity to push a ban on activities that deliberately create space debris. The undesirability of space debris is something that nearly everyone seems to agree on.

Fourth, the United States has the option of encouraging partnerships that support the peaceful uses of space. The best hope for integrating China among those countries seeking to promote space for peaceful purposes is to include China in international partnerships to support such aims. In a globalized world—and China is increasingly integrated to the rest of the world economically—countries that are more closely connected with other nations will find it in their own best interests to maintain the system rather than disrupting it. Europe is far ahead of the United States in understanding and implementing this premise. While care would need to be given to how and how fast China is integrated in areas involving dual use technology, the United States could achieve this aim to

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[26] See the Stimson Center website at: http://www.stimson.org/space/?SN=WS200702131213.

the ultimate benefit of the security of all. Such an engagement strategy need not reward China's *reckless* behavior. Instead, it could enhance U.S. space security by allowing a better appraisal of Chinese capabilities *and* intent, as well as providing the United States with possible positive leverage. Possibilities for such a partnership could start small, working toward goals of common interest, such as preventing satellite jamming, protecting astronauts, or carrying out environmental monitoring. Giving China a vested interest in a stable system could dissuade and deter activity that would be perceived as aggressive by the United States as well or better than relying only on military technology.

CONCLUSION

To its credit, the United States did not overreact to the Chinese ASAT test. Hopefully, the test will trigger debate in the United States on the viability of the current U.S. approach to space security. Whether current reliance on primarily technological guarantees for space security can be altered toward an approach that includes non-technical means remains to be seen. According to evidence outlined above, such a strategy would constitute a more productive road to space security for the United States, and for other countries as well.

INDIAN PERSPECTIVES ON REGIONAL SPACE SECURITY

Dipankar Banerjee

> "Future historians may well see Beijing's use of a missile to destroy an old weather satellite as having more lasting global impact than the Iraq war."
>
> *International Herald Tribune*, January 21, 2007

The above quote from the well-known international newspaper captures the essence of the challenge facing the global community today. Whether China's anti-satellite (ASAT) test poses an impending threat to the world may not as of now be the issue, but the possibility of a destabilizing arms race in space could well be a likely fallout. Is space to be an important factor in our future prosperity, or will it be a scene of impending conflict? The Chinese ASAT test carried out on January 11, 2007 (U.S. time) raised these issues and focused global attention once again on the criticality of this question. On this day, a Chinese CSS-2 missile destroyed one of China's aging weather satellite called the *Feng Yun 1-C* (*FY-1C*) by crashing into it. The capability demonstrated by this test is neither unique nor difficult for a country such as China with its advanced ballistic missiles, space-tracking capabilities, and the means to precisely insert a satellite into orbit. The questions that arise are the aims and motivations behind this test, the nature of decision-making for approval, and its timing. Why did China demonstrate this capability and do it now?

Whatever may be the case—and the world would like to welcome the Chinese official spokesman's subsequent assurance on January 23 that the test was not "aimed" at anyone—both the consequences and implications are sufficiently grave as to constitute a "wake-up call" to the world. It called for a re-examination in India of its own policies and programs. This essay will attempt to reflect on India's regional space security perspective, its space policy, and developments and debates in India after the tests.

CHINA'S ASAT TEST AND ITS IMPLICATIONS

China's ASAT test came as something of a surprise to the world, as Beijing's policies until recently were in opposition to such a test. Less than two years ago at the Conference on Disarmament in Geneva, it had put forward as proposed treaty language a requirement: "…not to place in orbit around the earth any object carrying any kind of weapon; not to deploy such weapons on celestial bodies nor station such weapons in outer space in any other manner; and not to resort to the threat or use of force against outer space objects."[1] But, more curious perhaps is the timing, the ominous silence that followed, and the absence of a sufficient and credible justification afterwards. It went against international norms and China's own recent policy of presenting a benign face to the world through its propagation of the theory of "peaceful development" and a "harmonious society."[2] These were two theoretical constructs that were advanced after great deliberation at the highest levels of the Communist Party and which were designed to counter the so-called "China threat theory." Did not the test go counter to these very policies by demonstrating China's ability to take war to a new frontier?

Even more problematic would be if this decision was in some sense reflective of a disjunction between the political leadership and the People's Liberation Army (PLA). Surely, if he had been fully informed, President Hu Jintao, as the Chairman of the Central Military Commission and in supreme command of the armed forces, would have more fully appreciated the political repercussions and not allowed the test. Did the PLA then go deliberately against his wishes? Or, having obtained some sort of tentative clearance, did it go ahead with the test without fully appreciating the possible international repercussions? Both are causes for concern. If the test was indeed a carefully considered deliberate decision of appropriate authorities, would not the government have been ready to come out early with a carefully articulated justification? On the other hand, if the decision was driven by the PLA, it then poses other important questions to which the

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[1] UN Conference on Disarmament, "Final Record of the Nine Hundred and Eighty-Eighth Plenary Meeting," June 30, 2005.

[2] It is likely that the theory of a "harmonized society" will be further articulated in the coming year, as it is a step forward from "peaceful development" and is expected to launch China's "soft power" ambitions in conjunction with the Beijing Olympics.

world would like answers. In an off-the-record briefing in India weeks after the ASAT test, the Chinese foreign minister said that it was meant for the advancement of technology and was entirely for peaceful purposes.[3]

One possible explanation can also be found in China's desire to develop asymmetric responses to what it sees as the substantive lead enjoyed by the United States in space technology. By demonstrating its capability of destroying space-based assets, albeit at low-Earth orbital altitudes, it is attempting to provide credible threats to the vital assets of its possible adversaries. This appears to be the case; even the debris factor then acts as additional deterrence to space use by others, even if it is patently indiscriminate and harmful to everyone's interests. How far these assumptions are valid will probably never be known in the absence of a clear-cut explanation from Beijing, which will surely not come.

OTHER INTERNATIONAL RAMIFICATIONS

The other major development affecting the space scenario, as seen from India is the U.S. insistence on ballistic missile defense. The history of this goes back at least five years to the U.S. withdrawal from the Anti-Ballistic Missile (ABM) Treaty and need not be revisited here. But, the concerns of both Russia and China and indeed other members of the international community of its consequences must not be underestimated. It may be a prelude then to the deployment of offensive military capabilities in space, such as laser weapon systems to shoot down impending missiles. This will then deal a decisive blow to those who still hope to prevent weaponization of space. At another level, recent measures by Russian President Vladimir Putin to abrogate the Conventional Forces in Europe Treaty and resume regular long-range training flights by Russian bombers demonstrate a reversion to the Cold War and the possibility of an arms race that may even be extended to space. The rapid transformation of the Shanghai Cooperation Organization (with China in the lead and Russia, Kazakhstan, Uzbekistan, Tajikistan, and Kyrgyzstan as other members) from an entity for regional economic cooperation to a security organization on the lines of NATO is another aspect of this policy. The joint military exercises conducted by these six countries in the summer of 2007 in the heart of Central Asia are another manifestation of this response.

China appears deeply unhappy over the U.S. moves, which is probably the reason for it to strongly support an international treaty banning weapons in space. Its frustration at not making progress on this

[3] Ibid. An assessment of a senior government official.

matter in the international disarmament arena may well be additional reasons for conducting the ASAT test and serves the purpose of a wake-up call. The deployment of a ballistic missile shield by the United States will downgrade the effectiveness of China's nuclear deterrent, which it will have to try to rectify at an early date. China will need to respond by increasing both the numbers and effectiveness of its strategic missiles through increased production and modernization. The cost factor may not be a major hurdle in China's booming economy, but the implications of an arms race and the possible realigning of strategic relationships in Asia cannot but affect China's neighbors. Beijing's goal to emerge as the leading power in Asia as a first step to a more prominent global role in the not-too-distant future might then come to be seriously challenged. A number of recent developments may be seen from Beijing as not very propitious.

The first is the India-U.S. strategic partnership and the associated nuclear deal.[4] Nothing in recent years has disturbed China more than this, even if it is not articulated openly. India is an important neighbor with whom China's relations have substantially improved since 1996, if not earlier.[5] But an emerging India that may come to match China in economic capabilities, albeit in the somewhat distant future, and thus challenge its leadership in Asia, has attracted Beijing's attention since about 2002. Until then, China never considered India as a possible competitor. In any case, China thought that India could be easily contained within South Asia through its strategic relations with Pakistan and arming it with the requisite nuclear and weapon capabilities. But a coming together of the United States and India in strategic cooperation—in addition to the civil nuclear deal—is of great concern and can seriously jeopardize China's claim to preeminence in Asia.[6]

The second issue is possible strategic cooperation between the United States, Japan, Australia, and India. A partnership between four democratic countries with their advanced economic capabilities along the

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[4] [Editors' note: The U.S.-India nuclear deal is still not in force as of this writing.]

[5] President Jiang Zemin made his historic visit to South Asia that year and signed an important treaty for Military Confidence Building. Prime Minister Narasimha Rao had visited China in 1993, and signed a Treaty on Peace and Tranquility.

[6] In several visits by the author to Beijing and Shanghai in 2006-07 at official and academic conferences and discussions, this issue became fairly clearly discernible. The objection to the Indo-U.S. nuclear deal and particularly to the 123 Agreement by the Indian Communist parties is also related to this. As Beijing's partner, if not surrogate in India, it opposes the agreement to the point of attempting to bring the government down on August 18, 2007.

fringes of East Asia again fundamentally challenges China's ability to dominate the broader region. Even informal discussions between these states at the margins of official conferences have drawn demarches from Beijing.

The other issues are the unforeseen fallouts from the Iraq conflict and Iran's possible acquisition of a nuclear-weapon capability. Also of concern are Japan's more assertive foreign and security policies and, finally, China's own growing concern over protecting its sea lanes of communication, both for its energy imports as well as the growth of its burgeoning trade. It is possible that in these changing circumstances and with its own more assertive policies, China sees advantage in both demonstrating its own space prowess and in calling global attention to the issue of weaponizing space.

WEAPONIZING SPACE AND SPACE SECURITY

The possibility of weaponizing space has been with us now for several years. In recent times, the First Gulf War (Operation Desert Storm) demonstrated the potential of high-technology warfare conducted with the help of space-based systems. The Second Gulf War (Operation Enduring Freedom) a dozen years later demonstrated the exponential advance of technology and the greater dependence of modern militaries on space. It may be argued that war-fighting weapons are yet to be deployed in space and hence that weaponization has not occurred, yet facilities from space have significantly furthered the ability to pursue war on the ground.

Comparing this capability between the two wars in 1991 and 2003, it should be noted that the force to bandwidth ratio, that is the number of people deployed to the amount of bandwidth available, increased by almost 250 times. Transmission of air tasking orders, which took almost an hour in 1991, took less than 10 seconds in 2003. Sensor-to-shooter time was reduced from two hours to 10 minutes or less. Employment of precision-guided weapons increased from seven percent to 68 percent and, in critical situations, to 100 percent.[7] All of these capabilities are derived from communication, surveillance, and guidance satellites without any active deployment of military weapon assets in space. Only when it comes to the deployment of lasers and other high-technology strike capabilities can space be considered not to have been weaponized. Though there are several treaties governing activities in space, there is none forbidding deployment

[7] Presented by a senior Indian Air Force Officer at a seminar after the China ASAT test in New Delhi in April 2007.

of weapons, and the international community is not moving fast enough to enact such an agreement. China's ASAT test has helped raise to the top of the international agenda issues of space security on which otherwise there seemed to be little possibility of action.

India views its space security as the "security of space assets and infrastructure, their renewal and expansion where needed, and the continuity of the operational services of its space assets." India recognizes the vitality of space systems, ground segments, and their supporting links for civil, commercial and other peaceful uses of outer space. The protection of these systems and unhindered and uninterrupted operation of and services derived from these is its prime responsibility towards its own people and the entire humanity. This must be also in the context of a "secure, sustainable and denial-free access to and use of space for peaceful purposes for one and all."[8]

What threatens space security? Several developments in the last five years may be said to have indeed worsened the situation. The first perhaps was the unilateral withdrawal from the ABM Treaty in 2002 by the United States. The second was the historical U.S. vote in the UN First Committee in November 2005 against the resolution on the Prevention of an Arms Race in Outer Space (PAROS), a statement of collective will against the deployment of space weapons.[9]

The third issue is the "policy of negation" being propagated by the United States. The National Reconnaissance Office as of 2003 began to talk openly of the possibility of actively denying the use of space for intelligence purposes to any other nation at any time. The fourth is the general trend against developing new legal regimes and in favor of unilateral actions. Finally, of course, is the recent ASAT test by China.

Collectively these policies constitute a potentially volatile mix. If pursued, they will tear apart the basic fabric of collective security. The absence of faith in rule-based approaches to global security is what may be considered to be truly deplorable. India believes in the right of all countries to enjoy access to space and have the opportunity to utilize space for developmental programs. The respect for safety and security of space assets and capabilities of all countries, without any denial or threat of denial of

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[8] These are non-attributable notes from a recent conference on space security made by several official and non-official Indian participants.

[9] [Editors' note: U.S. opposition to the PAROS resolution has been long-standing and continuing, although until 2005 Washington had voiced its displeasure by "abstaining" in the yearly PAROS votes at the United Nations.]

access to space, is the inevitable necessity for all to preserve and prosper together.

INDIAN SPACE POLICY

India's Permanent Representative to the UN Conference on Disarmament in Geneva Shri Jayant Prasad articulated India's policy on space on February 2, 2006, by explaining:

> India has created a growing infrastructure, including deployment of several satellites in space for communications and remote-sensing and for the utilisation of space technology and assets in space for such diverse acts as agriculture, health, education, natural resource management and disaster management. India is, therefore, committed to the peaceful pursuit of space technology and to preserving outer space, a common heritage of the mankind, exclusively for peaceful uses. We share the concerns about the dangers of deployment of weapons in the outer space and believe that this will not be in our collective interest. We regard the Conference as the appropriate forum to deal with this issue.[10]

At the end of January 2007, during the visit of President Putin to India, a joint statement was released with Prime Minister Manmohan Singh calling for "weapons free outer space." This was in response to the Chinese ASAT test a couple of weeks earlier. India believes that an international treaty banning the testing, deployment, and use of weapons in space and weapons that target space assets would seem a prudent course of action. India recognizes that space is of legitimate and growing interest to defense planners today. Therefore, the militarization of space has become a reality, and Indian national security interests should be aware of this reality. The Indian planning process should also take this reality into account. At the same time it is also in the Indian national interest to preserve some room as India moves forward. The long-standing international consensus on peaceful uses of outer space could be undermined by the deployment of

[10] See his speech at: http://www.meaindia.nic.in/speech/2006/02/02dao1.htm.

weapons, and there is thus an imperative to redouble efforts in order to ensure that space remains the common heritage of all mankind.[11]

THE INDIAN SPACE PROGRAM

Indian space program is captured entirely within the ambit of the Indian Space Research Organization (ISRO). ISRO was set up as a department under the Atomic Energy Cooperation (AEC) in 1969. The AEC was then headed by Dr Vikram Sarabhai, who also held charge of ISRO as a dual responsibility at its inception. Sarabhai may be best described as a "renaissance man" of wide interests and deep cultural sensitivities steeped in Indian traditions. He spent much of his two years at the head of the organization in preparing a vision statement, which has held for the last four decades. The space program was to be deeply rooted in the societal needs of the nation. He was against any form of weaponization and strongly believed that "we must be second to none in the application of advanced technologies to the real problems of man and society, which we find in our country." His vision also recognized that promotion of space research, besides contributing to societal benefits and enrichment, also results in intangible benefits coming out of the need to develop high technologies for economic development and security. These have remained as fundamental principles guiding the goals of ISRO throughout its history.

The priority in the initial years was on remote sensing, telecommunications, and meteorology to meet the most pressing needs in India at the time for accelerating agricultural production. Two pillars on which space policy would rest were: first, commercial procurement to save energy and time; and, second, self-reliance essential for a country of India's size to maximize space's benefits without hindrance. This would also ensure total autonomy over its entire program and functions. India has, of course, had several cooperative projects on peaceful uses of space with the Soviet Union and Russia, the European Union, and the United States. Particularly significant is the vision statement signed on June 25, 2005, at Bangalore after the India-United States Conference on Space Science, Applications and Commerce—for strengthening and expanding cooperation.

ISRO today has a budget of U.S. $700 million (2005-06) and has a personnel strength of 16,500. The accumulated expenditures on ISRO's

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[11] From the proceedings of a seminar on Space Security held in New Delhi in April 2007.

programs over a period of 36 years from its inception to March 31, 2006, are U.S. $7 billion.[12] The financial gains to the country through ISRO's numerous programs cannot be measured entirely in financial terms, but will be several times this figure. Besides, India is also determined to exploit its space capability to generate resources. It had set up a commercial arm, the Antrix Corporation, which exploits ISRO's capability through support of limited space programs in other countries. India entered the commercial satellite launch business in 2006 with significant achievements and brought in U.S. $500 million that year, well over half of ISRO's annual operating budget. Its ambition is to acquire 10 percent of global commercial satellite launch capability within a decade. As of now the ISRO has launched 22 launch vehicle missions and 53 spacecraft missions.

The principal launch vehicles of the ISRO are three:

- The Polar Satellite Launch Vehicle (PSLV), which has a payload of 1,500 kg; there have been nine flights from 1993 to 2007.
- The Geo Synchronous Launch Vehicle (GSLV), which has a payload of 2,250 kg; there have been five flights between 2001-06.
- The Geo Synchronous Launch Vehicle Mk III which has a payload of 4,000-4,500 kg and which is yet to be flight-tested.

A major step forward in India's space program was India's launch on January 10, 2007 (a day before the Chinese ASAT test) of a satellite that de-orbited safely into the Bay of Bengal and was recovered on January 22. This makes India the fourth nation to have accomplished this task. An ambitious program announced by the prime minister on Indian Independence Day (August 15, 2003) was ISRO's plans to launch a satellite to the Moon, the Chandrayan project. Speaking in September 2004, G. Madhavan Nair, the head of ISRO, said that the first flight of Chandrayan is on schedule for 2008.[13]

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[12] K. Kasturirangan, "India's Space Enterprise—A Case Study in Strategic Thinking and Planning," K.R. Narayan Oration delivered at the Australian National University, Canberra, in 2006.

[13] "India's Unmanned Moon Mission Going Smoothly: Official," Spacedaily.com website, September 27, 2004, at: http://www.spacedaily.com/news/india-04p.html.

The Indian military has no dedicated satellites for military application. However, the Monterey Institute's Center for Nonproliferation Studies notes that the *Technology Experiment Satellite* launched in 2001 and *Cartosat-1* launched in 2005 are dual use and hence can be used for both civil and military applications.[14]

THE INDIAN RESPONSE TO CHINA'S ASAT TEST

What were India's responses to China's ASAT test? It appears that the first response was to move toward setting up an aerospace command under the Air Force. This has been under serious consideration for about a decade, but had gotten nowhere near approval by the government. After the ASAT test, according to the then-Air Chief Tyagi, apparently some decision seemed to have been taken to form this command, and a core team has been constituted.[15] However, the very next day the Defence Minister seemed to have countermanded this view by saying that the government of India will not act in haste and that more deliberations were needed.[16]

Some more deliberation is indeed needed. Even though it is claimed that such an aerospace command will be an entirely defensive command and will only attempt to harmonize and rationalize space capability through a single-point organization, it is bound to impact on India's long-held policy of ensuring that space is non-weaponized and used only for peaceful purposes.

It remains to be seen whether additional funds and capabilities are to be devoted to India's peaceful space program. Will the Moon mission be put forward and will concrete plans be evolved regarding manned space flights? A mission to Mars also appears to be in the cards, but probably only in the imagination of people. More important will be accelerating existing programs and allotting greater resources.

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[14] Website of the Center for Nonproliferation Studies, Monterey Institute of International Studies, "Current and Future Space Security," profile for India, at: http://cns.miis.edu/research/space/india/index.htm.

[15] Sudha Ramachandran, "India enters the space age," *Asia Times*, February 6, 2007.

[16] Jatinder Singh, "China Flexes space muscles," *The Hindu*, April 1, 2007.

CONCLUSION

The Chinese ASAT test was, in a sense, both a surprise and a shock. Yet, the advanced nature of China's space program was well known, particularly after the success of its initial manned mission in October 2003. But that China's efforts would take a turn to direct weaponization was perhaps not readily accepted. Apart from its civil ramifications and signals, there are direct military implications as well. A number of military scenarios can indeed be visualized where this capability will provide Beijing with a decisive advantage, notwithstanding its improving relations with its neighbors. The coming months will likely see action on several fronts around the world. Will it then lead to a more secure and peaceful world?

JAPANESE STEPS TOWARD REGIONAL AND GLOBAL CONFIDENCE BUILDING

Kazuto Suzuki

Since the beginning of space activities, Japan has been reluctant to engage in any security-related uses of space. This is largely due to the fact that Japan, with a pacifist constitution, has sought to refrain from using space for security purposes. In 1969, the Diet adopted a resolution called "Space Development for Exclusively Peaceful Purposes," which set a limit for the Japanese government against any involvement by defense authorities in investment, ownership, or operation of space systems. In other words, all Japanese space programs should be excluded from military content and conducted under civilian authority in the name of the research and development of new technology.

Although the use of the term "exclusively peaceful purposes" is not unique (since it also appears in the Outer Space Treaty and the European Space Agency Convention), the interpretation of this clause in Japan is different from that in most other contexts. In the deliberations on the resolution in 1969, Diet members argued that this clause should be interpreted as similar to the case of peaceful uses of atomic energy. To Japanese minds, both atomic energy and space are dual-use technologies, i.e., technologies that can be used both for civil and military purposes, and both were developed for military purposes. Also, the newly established Science and Technology Agency (STA) was in charge of both technologies, so that Diet members had no doubt that the use of space technologies should be as rigidly restricted as atomic energy. Since Japan had suffered from the trauma of nuclear holocaust in Hiroshima and Nagasaki, there was very strong skepticism toward the peaceful use of nuclear technology, and therefore, the Diet established clear rules that the technology should only be used for civilian purposes, meaning that defense authorities could not become administratively, financially, or politically involved in the development or operation of nuclear technology programs. This interpretation of "exclusively peaceful purposes" was directly transplanted to space.

This resolution also reflected the mood of late 1960s. Politically, there was a sharp confrontation between the Left and the Right, pacifists

against nationalists. The Leftist-pacifist parties, such as the socialists and communists, claimed fiercely that existing space technology was driven by military purposes, but that Japan, as a pacifist nation, should not take the same route. Thus, the principle of "Open, Autonomous, Democratic" became the core code of conduct for Japanese space activities. "Open" meant a transparent decision-making process, for which the Space Activities Committee (SAC) under the prime minister's office became the highest authority. The discussions and rulings of SAC were to be open and transparent (which would allow anyone to gain access to technical information on Japanese spacecraft), so that anybody could attend the meetings and listen to the highest decision-making discussions on any occasion. "Autonomous" meant that Japanese space policy should aim to be less dependent on U.S. technology, since existing Japanese launch technology, as well as application satellite technology, had been transferred from the United States. Although Japan had developed its own domestic solid-rocket technology at the Institute of Space and Astronautical Science (ISAS), the Sato government in 1969 had decided to accept the U.S. offer for technology transfer of liquid-rocket technology. "Democratic" meant that the control of space policy should be conducted at the Diet level, not in government ministries. However, this part was not fully implemented since the interests and enthusiasm of politicians for space declined.

Because of this Diet resolution, space activities were entirely isolated and folded into Japanese "science and technology" policy. The strategic goal for Japanese space policy was, thus, to "catch-up" with other advanced space-faring countries like the United States and Europe. For many politicians, space was a "necktie of the advanced countries," which suggested that Japanese space policy was developed for the national prestige of being a member of the club of advanced industrialized countries.

This normative context is extremely important for understanding current developments in Japanese space policy-making. For a long time, most of the space program—even application projects for communication, broadcasting, and meteorology—was driven by a quest for technological excellence. In other words, robustness, reliability, and low cost were not priorities for Japanese space manufacturers. The manufacturers, engineers, and bureaucrats were more interested in adapting new technologies and making progress in engineering know-how. Furthermore, because space policy was folded into science and technology policy, the focus on technology and R&D allowed politicians and financial authorities to justify granting relatively large budgets to the space program. In short, Japanese space policy was driven by engineers and bureaucrats.

Furthermore, this space policy paradigm was also well-justified under the Cold War strategy of Japan. During the Cold War, Japanese government kept a low profile on defense spending because of its reflection on the militarism of World War II. It focused on strengthening Japan's technological competence and capability due to an understanding that Japanese defeat had come largely because of the country's technological inferiority to the United States. Also, Japanese strategy in the international arena was to join the big countries' clubs, i.e., becoming a member of Organization for Economic Cooperation and Development (OECD), the "Group of Seven" industrialized states, and, ultimately, the UN Security Council as a permanent member. All of these Cold War principles were based on a fundamental strategic decision: to respect the alliance with the United States. Since Japan kept to its constitutional constraints and low profile in defense capabilities, the alliance with the United States was of crucial importance. The Japan-U.S. alliance was a unique one, due to the fact that Japan would not be able to deploy combat troops outside its territory. So, Japan heavily depended on U.S. forces for protecting its territory, but Japan was not obliged to help protect U.S. territory. This unbalanced and unequal relationship would only be kept as long as there was a commitment by the U.S. government. In order to keep Washington committed to the protection of Japan, Tokyo needed to show strong respect for the United States. If Washington were to lose interest in protecting Japan, it would mean the death of the country.

Japanese space policy was synchronized with the Cold War strategy of Japan. Keeping defense investment out of space activity, focusing on technological capability, joining the major-power space projects (such as the *International Space Station*), and maintaining a strong tie with the United States were in agreement with Japan's Cold War strategy.

However, this long-serving Japanese principle of "non-military" uses of space may be about to change, due to the newly proposed draft Basic Law for Space Activities. This law aims to redefine the purposes and rationales for Japan to invest in space. For the first time, the terminology of "security" appears in the official document. This paper explains why the concept of security is suddenly appearing now, what purposes it relates to, and what specifically would change if the new Basic Space Law is passed.

SHOCKS IN THE POST-COLD WAR PERIOD

For a long time, particularly during the Cold War, the notion of "non-military" uses of space did not encounter any problems. The U.S.-

Japan alliance provided the necessary infrastructure for intelligence gathering and telecommunications from space, and the pacifist constitution prohibited the Japanese Self-Defence Forces (SDF) from being deployed beyond the country's borders. However, the end of Cold War has brought new circumstances to Japanese space strategy. First of all, changes in the security environment have made it difficult for Japan to continue its pacifist policy. In the Cold War context, there was mutual interest between the governments of Japan and the United States. For the U.S. government, it was important to have Japan as a front-line defense against the Soviet and communist threat to the Pacific Ocean. For Japan, the alliance with the United States was the core of its pacifist concept of not having any offensive military forces. Without U.S. forces present in Japan, the country would only be able to defend its territory when the hostile action took place within its borders; it would not be able to take any counter-measures against the enemy's territory.

However, the situation in the post-Cold War period is somewhat different from the previous period. The threat of communism has dropped dramatically, and the reasons for stationing U.S. troops in Japan have become ambiguous. Although the United States still perceives a need to station forces in Japan as a forward-deployment base, it is no longer an imperative to protect Japan in the name of the alliance. For the U.S. government, a unilateral collective defense, i.e., a U.S. obligation to defend Japanese territory and forces while Japanese forces have no obligation to protect Americans, is too much of a burden. Thus, the U.S. government demands that the Japanese government "share more of the burden" of the alliance's global security responsibility. In other words, Japan should contribute more to the actions of the United States in security matters. The consequence of this shift can be seen in Japanese participation in the War on Terror, particularly its deployment of naval forces to support the U.S.-led operation in Afghanistan and deployment of ground troops to Iraq.

Through these operations, the SDF has realized that an important technological gap exists in its own operations. Since the SDF was restricted from developing and operating its own space capabilities, it traditionally had to rely on commercial satellite communications and commercial imagery services. Because the SDF was not supposed to go beyond its borders, there was no need for long-distance military communication or imagery collection on countries other than its neighbors. Furthermore, through these operations, the SDF realized that there is a wide gap in military technology between Japanese and U.S. forces, particularly given the fast-developing U.S. military transformation and the space-supported Revolution in Military Affairs (RMA). Given the increasing possibility of

Japan's sharing more of the security burden and engaging in joint operations with U.S. forces, the SDF and the Japanese Defense Agency (JDA, now the Ministry of Defense) has recognized the importance of developing its own space capabilities to narrow the gap.

However, that is not the end of the story. The perception of the Japanese people on security matters has been dramatically changed by two events. First, the imminent threat of North Korea has become visible since its Taepodong missile flew over Japanese territory in 1998. This was a big shock to the policy paradigm. The incident put the Japanese public as well as the policy community into a panic mode. There was a strong demand to do something to avoid future North Korean missile launches against Japan and to protect the homeland. Thus, immediately after the Taepodong test, the government made a decision to start a new satellite program, the Information-Gathering Satellite (IGS).

TROUBLES WITH INFORMATION-GATHERING SATELLITES

The launch of the IGS faced serious constraints due to the existing legal interpretation. Although it was clear that the purpose of the IGS was to monitor the military activities of possible adversaries, such as North Korea, it was disguised as a "multi-purpose" satellite in order to emphasize its civilian purposes in order to comply with the 1969 resolution (since it was difficult even to mention the phrase "dual-use," since this implied the possible participation of the JDA).

However, this arrangement faced a difficult problem. In the 1980s, when there was serious trade friction between Japan and the United States, the U.S. government had pressured Japan to opening its public procurement market in order to reduce the U.S. trade deficit. One target was the satellite industry, where Japanese companies had enjoyed exclusive contracts from the Japanese National Space Development Agency (NASDA). The U.S. government found that it was unfair to exclude the U.S. satellite industry entering competitive bidding and therefore threatened the Japanese government by applying the so-called "Super 301" sanction, which allowed Washington to impose punitive tariffs on Japanese products entering the United States. In order to avoid the application of "Super 301," the Japanese government concluded a 1990 accord on non-R&D satellite procurement. This accord obliged the Japanese government and industry to open up the procurement process of civilian application satellites to international competitive bidding. As a result, almost all Japanese civilian non-R&D satellites (for communications, broadcasting, and meteorology) shifted to non-Japanese products (18 out of 19 current satellites were

produced by American companies, and only one, *MTSAT-2*, is Japanese).

Because of this 1990 accord, the IGS as a civilian non-R&D satellite should have been placed under the open procurement procedure. This put Japanese government in a serious dilemma. If the government wanted to develop the IGS as multi-purpose satellite, the specifications of the satellite had to be open to the public due to the 1990 accord, but the 1969 Diet resolution on space also forbade it from being granted "defense satellite" status (which might presumably have allowed it to be exempted from the 1990 accord).

The solution of this dilemma came through a careful legal interpretation and related maneuver. The government placed the control of the satellite not under JDA, but the Cabinet Secretariat, a small office charged with national-intelligence-gathering and crisis management functions. So, the IGS was formally designed as a "crisis management satellite" with both civilian and military purposes.

This incident provided a wide-ranging understanding among politicians that the legal constraints of the "Exclusively Peaceful Purposes" resolution were too strict and inflexible. Given the changing security environment in the post-Cold War period, it seemed nonsensical to continue to maintain such rigid pacifist rules.

Furthermore, the Japanese Cabinet decision to participate in the joint U.S.-Japan Missile Defence (MD) program in 2003 raised another difficult question for the Japanese space and security community. On the one hand, because of the "Exclusively Peaceful Purposes" resolution, the JDA and SDF would not be able to develop, launch, and operate its own early-warning or tracking satellites, which gather crucial information about missile launches. Without its own satellites, the JDA would have to depend on early-warning information from the United States. However, if the JDA entirely depended on U.S. intelligence for initiating the deployment of MD to counter-attack missiles, this would touch upon the sensitive issue of "collective defense." The Japanese government had adopted a unique interpretation of Article 9 of the Japanese Constitution (which officially denies Japan the right to maintain military forces), by saying that although Japan had the right to collective self-defense, it would not exercise it. Thus, the U.S. alliance was based on the unilateral exercise of collective defense by the United States. So, if a Japanese MD system was set up and ready for operation, it would not be able to launch its counter-attacking missiles unless the command came from Japan's own early-warning satellite. In other words, if Japan's MD system were operated with U.S. satellite intelligence alone, it would be considered as an exercise of collective defense (i.e., a joint military operation) which is prevented by the existing

interpretation of the constitution. Thus, many people in the Liberal Democratic Party (LDP), particularly those who were interested in defense issues, strongly demanded that Japan reconsider the "Exclusively Peaceful Purposes" clause of the Diet resolution in 1969.

KAWAMURA'S INITIATIVE

Although there has been an increasing demand to alter the interpretation of the "Exclusively Peaceful Purposes" resolution regarding space, given mounting financial pressure to engage in administrative reform and to reduce the space budget, there has been no serious action taken by the government or politicians. However, an initiative was started in early 2005 by former Minister Takeo Kawamura, an LDP politician who had just left the Ministry of Education, Culture, Sports, Science and Technology (MEXT), which is responsible for the space program. During his ministership, he had witnessed the failure of H-IIA launch number six in November 2003, which carried two IGS satellites. Although he was only responsible for the MEXT component, which was the launch of the H-IIA, the public as well as the government chastised him for not having supervised a strategically important satellite project such as the IGS properly. From his point of view, this was a huge shift of responsibility and competence. Even though the current Japan Aerospace Exploration Agency (JAXA, formed in 2003) had been involved in the development and in some technical aspects of the IGS, Kawamura was clearly out of the loop and in no position to take responsibility. However, the main user of the IGS, the JDA, was not supposed to take responsibility for this program, due to the 1969 Diet resolution. The Cabinet Secretariat, the nominal authority for the IGS, was unable to take responsibility for its development and launch because of a shortage of manpower. Thus, neither the JDA, nor the Cabinet Secretariat, nor MEXT (and JAXA) were directly involved in the IGS program. Kawamura thought that this was a critical failure of implementing national strategy, and something had to be done.

As soon as he stepped down as minister of MEXT, he formed an informal study group called the "Consultation Group for National Strategy for Space" (often called the Kawamura Consultation Group) with its members consisting of LDP politicians working as vice-ministers in various ministries, including MEXT, the Ministry of External Trade and Industry, the JDA and the Ministry of Foreign Affairs (MoFA). The Consultation Group intensively discussed the problems in the Japanese space policy-making process, including possible amendment of the interpretation of "Exclusively Peaceful Purposes" resolution and several public-private-

partnership programs, such as the Quasi-Zenith Satellite System (QZSS) and privatization of the H-IIA.

After 10 meetings, the Kawamura Consultation Group produced a report in October 2005. This more than 100-page document argues that the sources of the problems in space policy-making are a lack of coherent strategy and appropriate institutional arrangements. Because of its historical background, according to the report, Japanese space policy has been dominated by the Science and Technology Agency and MEXT, and folded into the sphere of overall science and technology policy without a plan for using space assets to pursue national strategic objectives. This particularity of Japanese space policy-making process had let Japanese space industry down and kept the presence of Japan on the international space stage small.

Thus, this report proposed to establish a law to define new objectives for space activity and an institutional framework for making space policy-making process more coherent via three new arrangements. First, the report proposed that the government create a ministerial post with a portfolio for space. This new ministerial post would be the center for strategic thinking and planning about space. The report underlined that the source of the problems of Japanese space policy is its concentration on developing new technology and its lack of attention to the users' needs and demands. It claimed that the new minister for space would make efforts to bring the user-ministries into the process of policy-making for space and aggregate user needs, which would then be reflected in the R&D program. Also, the minister would engage defense and foreign policy authorities to use space assets to advance Japanese space capabilities for security and foreign policy purposes within the current constitutional framework.

This report also suggested that the political community, including members of the Consultation Group, should initiate a new discussion on reinterpretation of the "Exclusively Peaceful Purposes" resolution. Because this resolution was taken by the legislative body, the Diet, and it binds the action of the executive branch of the government, the decision to change the interpretation of the resolution should come from Diet members. As discussed above, political interest in space policy was low for many years, so there was no initiative from Diet members to change the 1969 resolution.

With these concerns in mind, the report of the Consultation Group was well received by members of the LDP and the government. Kawamura's initiative had paved the way for Japan to transform its space policy-making process.

TOWARD ESTABLISHING THE BASIC LAW

Kawamura's ambition did not stop with the publication of this report. He also brought his findings to the Policy Research Council of the LDP. As part of the ruling party, the LDP's Policy Research Council has strong leverage for changing government policy. It has the right to initiate policies and legislative actions; indeed, without the consent of this council, no legislative proposal was likely to pass the Diet. Kawamura found that it was appropriate to discuss his idea of reforming space policy-making in the LDP, rather than bringing the issue to the government (as often in the case of the Japanese policy-making process), because he needed the support of Diet members to re-interpret the "Exclusively Peaceful Purposes" resolution. With support from Hidenao Nakagawa, then the director of the Policy Research Council and the number three person in the LDP hierarchy, Kawamura established a "Special Committee on Space Development" (SCSD) and became the leader of the committee.

With a large number of Diet members now involved, the SCSD attracted a lot of media attention and gradually the participants in its meetings increased. By bringing space matters to the LDP as a policy priority, many Diet members began to realize the importance of space activities to national strategy. Through media coverage, the public too began to understand Kawamura's intentions. In July 2006, the multiple North Korean missile tests gave an extra boost to the SCSD, because public opinion shifted dramatically from holding onto past pacifist principles to a more flexible interpretation of the "Exclusively Peaceful Purposes" clause.

Under these circumstances, the SCSD of the LDP decided to submit the "Basic Law on Space Activities" into the summer 2007 Diet session (although it was submitted on June 20, it was scheduled to be discussed after the summer recess).

The first impression of the proposed Basic Law is that it is a straightforward reflection of Kawamura Consultation Group report. If passed, it will set up a new Minister for Space and a Space Development Headquarters (a forum of user-ministries to be granted strong authority). The Minister for Space would be a "specially designated" minister who would not be in charge of the management of the ministry, but would reside in the Cabinet Office to coordinate the space policies of different ministries. The space headquarters would be composed of all of the relevant ministries and some specially appointed members from academia and industry. Although this is an ambitious challenge, given the conservative attitude of the government toward any reform, there are hopes

that these new institutions would provide a positive force for more political attention and dynamism in space activities.

The second point of the revised Basic Law relates to the question of security. As discussed above, the "Exclusively Peaceful Purposes" resolution was under pressure from the changed security environment affecting Japan in the post-Cold War period. However, the SCSD, particularly with Kawamura as acting chairman, strongly emphasized that the change of interpretation does not aim for aggressive uses of space (i.e., enhancing Japanese military capability for invasion or using military forces to solve international disputes). Instead, the new Basic Law confirms that the space should contribute to the promotion of national and international security under the principle of Article 9 of the constitution and under Japan's international obligations under the Outer Space Treaty. The new Basic Law emphasizes that Japanese space assets will be used for crisis management and disaster monitoring in the Asian region or for peacekeeping missions in distant territories. It implies that Japan might have early-warning satellites for MD, which would fall under the category of self-defense. It only tries to change the past interpretation of the Diet resolution, which had prevented any use of space assets by military authorities.

CONTRIBUTION TO REGIONAL AND GLOBAL SECURITY

One of the issues that is now being hotly debated is Japan's role in regional and global security. As discussed above, the aim of the Basic Law is to reinterpret the 1969 Diet Resolution on "Exclusively Peaceful Purposes," and give more freedom for the government to utilize space for security and diplomatic matters. The combination of security and diplomacy in this context is very important. First, the primary objective of using space for security is to provide autonomous capability for territorial defense, particularly the MD system. However, given the relatively small size of Japanese territory, space is not the most useful tool. Japan's small islands with their highly developed terrestrial network do not require surveillance and communication capabilities in space. Furthermore, even in the Basic Law passed the Diet, there is a constitutional constraint that SDF cannot defend the country by attacking other states. Thus, the role of space would not be significant for purely defense purposes.

Nevertheless, Japan's contribution to peacekeeping and disaster relief operations has increased since 1992. As a result of the humiliating experience in the first Gulf War, where Japan contributed only cash but not troops, which was seen as a less-than-adequate policy by the coalition

forces and the Kuwaiti government, the Diet passed a law on "International Cooperation in Peacekeeping Activities," which allowed the SDF to participate in UN peacekeeping operations in Cambodia. After the successful mission in Cambodia, the Japanese government sent SDF troops to the Golan Heights, Mozambique, Rwanda, and East Timor. Furthermore, in the context of U.S.-Japan alliance, the Maritime SDF was sent to the Indian Ocean in support of U.S. operations in Afghanistan, and Ground and Air SDF were sent to Iraq. These operations required long-distance telecommunications and imagery intelligence of previously unknown locations.

In fact, this increase of peacekeeping operations has changed the views of Japanese citizens on the question of security. For a long time, the Japanese regarded the SDF as an "unconstitutional force," and the pacifists claimed that the competence of the SDF should be strictly limited. However, the SDF has gradually earned the trust of the Japanese people, and the political climate has started to change. It has been more that 15 years since the first SDF troops were deployed to Cambodia, and now no one in Japan doubts the intention of Japan to contribute to international security and peace through UN operations. In this regard, the Diet Resolution has become awkwardly irrelevant. The resolution states that space assets should be used for "exclusively peaceful purposes," but the SDF are not allowed to use space assets when deployed for maintaining the "peace" through UN operations.

In order to correct this contradictory situation, the new Basic Law reinterprets the Diet Resolution and would enable the Japanese SDF to fully engage in peacekeeping missions with support from space systems necessary for their operations. This would not only enhance the scope of operations and Japanese capabilities to contribute to global security, but also increase the efficiency and effectiveness of Japan's participation in the multinational operations.

Second, the combination of security and diplomacy is important because Japan would have the potential to change the security environment in Asia. There are number of issues that create unstable and fragile security conditions. First, the situation in the Korean Peninsula, particularly the North Korean nuclear and missile tests, pose serious threats to the region. Secondly, the opaque security strategy and non-transparent surge in the defense budget of China call for attention by many countries in this region. Particularly, the ASAT test in January 2007 refreshed Asian understandings of the potential capability of China's military force, People's Liberation Army (PLA). The purpose of the ASAT test is not yet publicly acknowledged, but it is suspected that this was conducted to demonstrate

that the Chinese PLA would exercise its capability to shoot down a satellite if foreign forces tried to intervene in China's domestic affairs, including over the Taiwan issue. Third, apart from the North Korean and Taiwan Strait issues, there are many hot spots around the region, including territorial disputes and resource management questions, such as: the Spratly Islands between China, Taiwan, the Philippines, Malaysia, and Vietnam; the Senkaku Islands between Japan and China; the Dokudo (Takeshima) Islands between Japan and South Korea; the Paracel Islands between China, Vietnam, and Taiwan; and the Kurile Islands (Northern Territories) between Japan and Russia. Perhaps the most important characteristics of the territorial disputes in Asia are that they are related to the sovereignty of small islands where the definition of territoriality is not clear, and all involve questions over the control of resources. Although these conflicts are contained within a larger context of international cooperation, such as through the Association of Southeast Asian Nations' ARF (ASEAN Regional Forum), they need to be closely monitored to develop confidence-building measures for ensuring stability in the region and pursuing peaceful solutions to conflicts.

The main question facing Japan is: what possible role can it play, given that it is a pacifist state (according to Article 9 of its constitution) and has renounced the use of force? Fortunately, several options still exist for contributing to the solution of Asian regional problems: specifically, the combined use of diplomacy, economics, and Japan's technological assets, including in space.

First, Japan needs to fully engage in developing regional forums for managing regional security. The ARF is obviously one central framework where all regional players together with the United States and Russia are involved. The role of Japan in the ARF has been rather small and has not made significant contribution yet, but there would be many ways that Japan can contribute to the ARF. Also, other regional organizations, such as the Asia-Pacific Economic Cooperation (APEC) forum and the East Asian Summit, offer important possible venues. APEC, although started as a pan-Pacific economic organization, has developed security-related discussions on such topics as export controls and nonproliferation. As a leading economy in this region, Japan has considerable leverage in APEC and could play an important role in the evolving East Asian Summit (designed to discuss an establishment of a European-like East Asian Community).

Second, Japan needs to prioritize regional interests rather than focusing solely on its own domestic agenda. Since the end of the Cold War, and especially after the launch of the Taepodong-1 in 1998, the Japanese

domestic mood has become more hostile and aggressive. Japan is considering changing the statute for its SDF to allow it to become a normal military force and to facilitate its participation in multilateral missions, such as UN peacekeeping operations. Japan's recent behavior in regional organizations—such as its focus on the abductees issue in the Six-Party Talks with North Korea—has sometimes produced negative effects. In order to play a leadership and solve international crises through diplomatic means, it is not a wise course of action to promote in these forums an exclusively domestic agenda.

Third, and in this context, Japan should use its technological advantage to take a leadership role in the region. During the Cold War, Japan was reluctant to step out of the shadow of the United States, in part due to its past history. But since the end of Cold War, while the United States still has considerable influence and provides infrastructure for maintaining regional security, its commitment is less than it used to be. On the other hand, China is emerging as a political and economic leader. China has been instrumental in the Six-Party Talks, and its contribution to regional security is widely appreciated. Japan, although its contribution is not widely known, has been working consistently in providing a technological contribution through the Asia-Pacific Regional Space Agency Forum. But to date, most of its activities have been uncoordinated and fragmented.

Thus, the new Basic Law on space, which aims to increase Japan's capability to use space technology for diplomacy and security, is appropriate in this context. It would enable the government to formulate a coherent policy by establishing an inter-ministerial forum and a minister for space who would coordinate space-related activities to strengthen Japan's international presence. Among these ministries, the Ministry of Foreign Affairs (MoFA) would be included. In fact, the MoFA is already conducting a study group on further utilization of Japan's space assets in foreign policy. Although there is no concrete policy that has yet been disclosed, this is a positive step in the direction that has been outlined above.

If we assume that this is the general trend for Japan in space, what might be proposed in terms of specific policy initiatives aimed at improving regional security?

One idea is for Japan to provide infrastructure for confidence building. This region has heavily depended on the security infrastructure provided by the United States on bilateral basis. For a long time, this was sufficient to maintain stability in this region because there was a general acceptance of U.S. leadership. However, the current conditions do not

allow an optimistic assumption that the US would play a "benign leader" role in Asia due to the changes discussed above. Thus, it may be time to consider the possibility to provide regional collective security infrastructure by the members of the region. Japan could be the most appropriate complement to the existing U.S. role in the region because of its ever-increasing alliance network and of its technological capabilities. It could begin, for example, by helping to establish an early-warning center to provide imagery intelligence data to increase transparency regarding troop mobilizations and proliferation monitoring. Satellite imagery is a powerful tool for increasing transparency and developing confidence-building measures. The "Eye in the Sky" project during the Cold War and the European Union's Satellite Center in Torrejon provide good examples. Although it is true that providing intelligence data is a very sensitive matter, it is possible that Japan could financially and technologically contribute to the establishment of a Regional Confidence-Building Satellite (with relatively low resolution) and a Transparency Information Center, where the operational decisions would be made and satellite imagery stored for the use of all of the contributing national intelligence agencies.[1]

Through the Regional Confidence-Building Satellite and the related Transparency Information Center, Japan could help serve as a "peace broker" in the region. Although Japan does not have the physical capability to contain regional conflicts, it can use its technological advantages to contribute to regional security and to encourage other countries to depend on Japan. If Japan is able to provide useful and effective means for maintaining regional security, East Asian states might appreciate these services and be more likely to accept Japan's proposals on the arbitration of conflicts. The credibility that Japan has nurtured for the last 60 years as a pacific nation could bear fruit if Japan takes such actions to improve regional security.

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[1] This proposal is not something out of the blue. The European experience in sharing information data through the EU Satellite Center and BOC (Besoin Operationnel Commun, or Common Operational Requirements) among France, Germany, and Italy demonstrates that sharing satellite intelligence data would contribute not only to the confidence building but also improving the efficiency of peacekeeping and disaster relief operations. Since there are only a few countries capable of operating imagery satellites in this region, it is extremely useful for the countries without imagery satellite to gain access to data for peacekeeping and disaster relief operations.

CONCLUSION

The changing nature of the Asian security environment has brought about changes in Japanese space policy since the late 1990s. With the Kawamura initiative, Japan is now moving toward adoption of a new Basic Law on Space Activities. This paper has tried to explain its objectives and the processes likely to be involved in this change. It has also raised a number of possible follow-on proposals.

From this discussion, it has become clear that Japan's response to the 1998 Taepodong-1 launch and the changing security environment is being conducted within its existing constitutional commitments and nature as a pacifist state.

Some in Japan might argue that it is not politically feasible to contribute unilaterally to regional security in the context of increasing instability in East Asia. However, given Japan's constitutional constraints and commitment to peaceful principles, promoting regional security by exercising the country's technological assets and working to assume a leadership role may be the best to ensure Japan's own safety, and it would also contribute to the interests of the broader East Asian community.