



IDA Research Notes

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Focusing on the Asia-Pacific Region

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Issue Overview

United States national security is inextricably tied to the Asia-Pacific region. Wars in Iraq and Afghanistan and the continuing struggle against terrorism may have pushed some Asian security concerns off the nightly news, but events – North Korean nuclear tests, concerns over U.S. dependence on consumer products from China, and the outsourcing of American high-technology jobs to India, just to name a few – remind us of the importance of maintaining strong and effective partnerships in Asia.

This issue of IDA Research Notes describes some IDA research programs focused on evolving U.S. strategic relationships in the Asia Pacific region. These projects fall into three general methodological groups:

- IDA analytical and capacity-building partnerships with governments and research institutes across the region.
- Strategic and policy analyses of the rapidly changing landscape of Asia, focusing on issues related to the new nuclear triad, WMD proliferation, strategic communications, and countering terrorism.
- Technical analyses of the rise of China as a producer of scientists and engineers.

IDA has established ongoing bilateral and multilateral partnerships with a number of Asian agencies and institutions in an effort to forge cooperative responses to the challenges of 21st century security. The Defense Resource Management Studies program has sent teams of IDA analysts to Mongolia, Thailand, Indonesia, and the Philippines to help these Asian security partners improve their military capabilities and strengthen civil-military relations by building more effective defense resource management processes. IDA teams have also worked with the Taiwan Ministry of Defense to improve its cost analysis capability to better inform Taiwan's decision-making on security needs. In a series of workshops on the Asian defense environment, IDA and Singaporean ministries and think tanks have explored a range of vital issues related to defense management and global security. IDA also has partnered with universities and security studies experts across the south and southeast

Asian regions to create the Council of Asian Terrorism Research, a virtual think tank dedicated to fostering cooperative international studies and analysis to advance the common understanding of the challenges posed by violent, transnational terrorist movements.

A multi-year program of IDA studies has focused on Asia's nuclear future. We have applied various analytical tools – including game theory, strategic personality analysis, Track Two engagement, Red Teaming, and interviews with North Korean defectors – to analyze the implications of the rise of new and potential Asian nuclear powers for U.S. and Asian regional security. The implications of China's nuclear modernization and strategic force modernization for managing the evolving U.S.-China-Russia strategic relationship have been an area of special focus of several of the studies mentioned here. Political and strategic affairs on the Korean peninsula are similarly in flux. IDA's access to political elites in South Korea as well as defectors from North Korea continues to produce studies that track the important trends in U.S.-Korean relations and their implications for U.S. security partnerships across Asia.

The rapid rise of Asian nations as economic, technological, and military players is a source of both satisfaction and concern for U.S. political and military leadership. The rise of China and India as major powers, the changing nature of U.S. alliances with Japan and the Republic of Korea, and the unpredictable nature of North Korea all pose major challenges for the U.S. Pacific Command (PACOM). As part of a wide-ranging analytical program in support of PACOM, IDA Red Teams have participated in its annual Terminal Fury exercises, adding a dimension of cultural and political fidelity that enhances PACOM's strategic communications capabilities. A series of IDA-led interagency workshops have helped promote more effective interagency cooperation in response to the changing economic and security relationships between the United States and China. Chinese potential to challenge U.S. engineering dominance is another concern. IDA studies of China's contribution to nanotechnology research and its production of new engineering graduates point to important implications for U.S. economic and military competitiveness in the decades ahead.

Making American Security Partners Better Resource Managers

by Wade Hinkle

IDA's Defense Resource Management Studies (DRMS) project helps American security partners increase military capability through improved management of defense resources.

The project has three primary objectives:

1. Assist key security partners in planning military capabilities that are effective and affordable.
2. Strengthen and deepen the defense linkages between the United States and its partners through professional exchanges at the staff and senior levels.
3. Enhance transparency and accountability in partner governments.

What began in 1990 as a single task to develop analytic techniques to assist the Egyptian Ministry of Defense in formulating an affordable multi-year plan for defense capabilities expanded in 1994, when OSD asked IDA to begin similar work with the aspirant NATO members in Eastern Europe. Over the next 10 years, IDA teams worked with counterparts in all of the new NATO member nations and in all of the Partnership for Peace nations, except Russia and Belarus.

In summer 2003, OSD asked IDA to focus on assisting key security partners in U.S. counterterrorism efforts. In total, IDA has deployed to 36 different countries in Europe, the Mideast, Asia, Africa, and Latin America. Since the shift in emphasis in 2003, we have focused on Asia, where, over the past 12 months, IDA assistance teams have worked with Brunei, Indonesia, Mongolia, the Philippines, and Thailand.

Methodology

Every country's resource management requirements are unique. Practices that prove successful in one country are not transferable

to others. In particular, the U.S. defense resource management system is complex, staff-intensive, and unlikely to transplant successfully to other nations. For this reason, we adapt the principles that underlie U.S. defense resource management, but apply them in ways more appropriate to the scale and situation of the host nation. We also draw heavily upon experiences and techniques from other defense ministries that employ modern management practices and from international institutions that specialize in public resource management.

In its work with partner defense ministries, IDA uses a four-phase building-block approach to management reform:

1. **Assessment.** The first phase provides a detailed assessment of force, resource, and budget-planning activities.
2. **Preparation and skill-building.** The next phase prepares the host country to implement new management processes and procedures. A critical part of this phase involves identifying the personnel and organizational realignment needed to implement the new processes and assisting in development of specialized skills and information systems.
3. **Implementation.** The host country then creates its first multi-year program and budget using the new processes and procedures.
4. **Sustainment.** Finally, a sustainment effort supports institutionalization of the defense reform effort.

This building-block approach assists the local country in exploring how best to design its internal management and decision-making process, to build the staff skills necessary to implement the system, and to begin analyzing the real-world resource issues confronting the host country

Force-Oriented Cost Information System

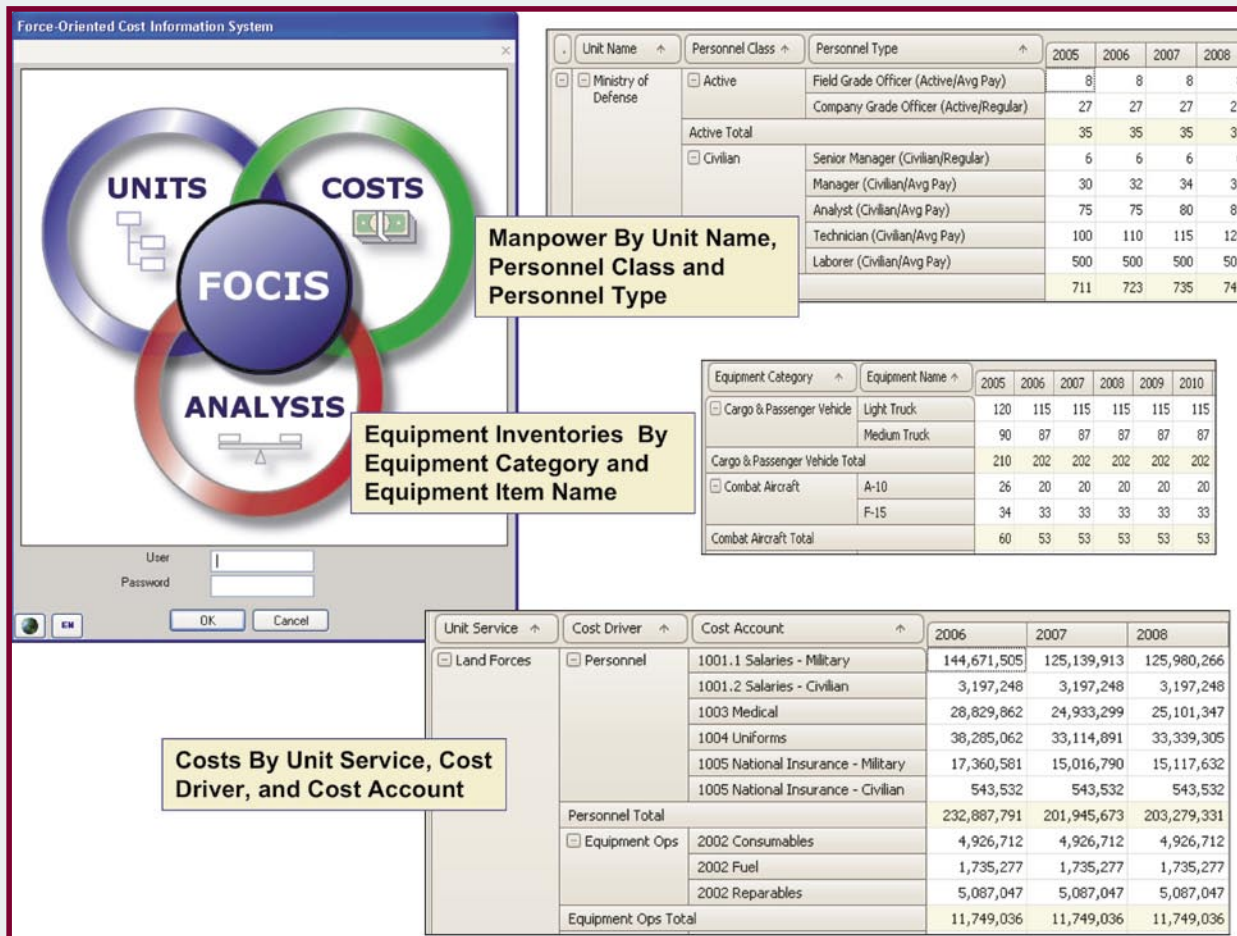


Figure 1. Sample output from the Force-Oriented Cost Information System (FOCIS), which is used to improve information, costing, and analysis capabilities in host countries.

military and its budget. The modular approach is structured so that a host country need not commit itself at the outset to devising and implementing a completely revised management process. The host country can use results from the first two modular phases to determine the desirability and scope of such process re-engineering, or elect to make a more targeted set of improvements.

Reinforcing materials help introduce and demonstrate concepts and principles common to effective defense planning by illustrating the steps needed in an integrated process from national-level policymaking through submission of the annual budget request. These consist of 16 separate packages with concept briefings, seminar-like skill-building exercises, and assessment questionnaires, complemented by a computer-assisted simulation of defense resource planning and skill-building analytic workshops.

Once a host country has designed its top-level decision-making process, the focus of DRMS work turns toward creating the technical analytic capability for cost and program analysis at the staff level. Early DRMS work employed the Defense Resource Management Model (DRMM), originally developed in 1991 to introduce improved information, costing, and analysis tools in host countries. Designed using late 1980s database and user interface technology, the DRMM was extremely complex and manpower- and training-intensive. In mid-2005, IDA and its OSD sponsor developed a DRMM replacement: the Force-Oriented Cost Information System (FOCIS) (Figure 1).

FOCIS allows users to create program assessments by tracking defense guidance objectives through programming to budgeting and program-budget implementation. It also

provides a transparent crosswalk between costs of resources used by consuming organizations and the funding that must flow to organizations that actually spend money. This greatly simplifies the work of tracking resources (such as fuel) that are typically centrally budgeted and purchased but also critical to individual unit readiness.



The Thai and U.S. DRMS team works in Bangkok, Thailand, in April 2007.

Prospects for the Future

When host countries are committed to improving resource management, DRMS can make a substantial contribution to helping them resolve shortfalls and direct limited resources to meeting high-priority needs. Since 2005, IDA researchers have worked with a host country DRMS team to help the Mongolian defense ministry assess the affordability of its long-term force structure and modernization plans. We have also assisted

the Philippine Department of National Defense in identifying funding priorities for internal security operations. DRMS teams are currently helping Thailand and Indonesia assess the scope of future management improvements. An IDA team in Brunei is assisting with introducing FOCIS to improve that country's cost and program analysis capability.

A sustained commitment to change on the part of local senior civilian and military leaders is vital to successful management reform. Equally important is the willingness to recognize that institutionalizing organizational change and management decision-making is a multi-year process and to commit at the outset to sustain such a long-term effort. Calibrating these considerations is much more art than science, but thanks to the IDA team's intense commitment to lessons learned and continuity of effort, our understanding of how to proceed has improved enormously since this project's inception.



Then-Secretary of National Defense Avalino Cruz, Jr., speaking at a workshop in Analyses of Alternatives in Manila, November 2006.

Collaborating with Singapore to Better Understand the U.S. and Asian Defense Environments

by Stephen Balut

IDA has been working with the Singapore Ministry of Defense (Mindef) and Defense Science and Technology Agency (DSTA) since 2001 to better understand Asian and U.S. defense environments. At that time, Singapore was taking major steps to transform the existing capabilities of the Singapore Armed Forces (SAF), but was experiencing large cost growth. Aware of IDA's experience and accomplishments in this area, senior Singapore defense officials sought an ongoing exchange with IDA to better understand the challenges of transformation. Mindef and DSTA representatives placed particular emphasis on improving their capability to estimate the costs of developmental systems. These overtures led to a series of workshops, held alternately at IDA's Virginia facility and in Singapore, and to exchanges of views on a series of topics related to defense management, global security, and joint warfighting.

The Workshops

The initial workshop, held at IDA in January 2003, included the following topics: cost estimation for developmental systems, including bottoms-up, parametric, analogy, and engineering cost estimating techniques; life-cycle-costs/total ownership costs and models for estimating components of life-cycle costs; and the rise of political Islam, which addressed political instability and spread of radical Islam in Southeast Asia.

These issues were further explored in the second workshop, held in Singapore in September 2003. Singapore representatives described their acquisition/procurement system, and IDA described DoD's acquisition system, including the development and flow of cost information to defense decision-makers. Discussions of the Southeast Asia security environment expanded to include discussions of an IDA-developed strategic personality framework and the rise of political Islam and its implications for China.

The focus shifted in the third workshop, held in September 2004. Participants addressed defense management, including life-cycle costs and operating and support (O&S) costs. DSTA representatives presented an overview of Singapore foreign military sales experience and a model for estimating manpower and other resources. Information technology support to command and control (C2) was a second subject. Topics included applying information technology to C2, network-centric concepts in C2, and integrated knowledge-based C2. A third subject, which related to the challenges of the emerging security environment in Southeast Asia, included several case studies.

The Singapore Defense Science and Technology Agency

Singapore's Ministry of Defense (Mindef) manages the acquisition of new systems and strengthens the operational readiness by testing new operational concepts, capabilities, technologies, and training methods. The SAF and Mindef work with partners around the world, including the United States, to promote dialog, confidence-building, and cooperation. The Strategic Framework Agreement reached with the United States in 2005 provides a framework for Singapore and the United States to expand the scope of defense cooperation and to work together to enhance regional stability and peace.

In 2000, Singapore's Parliament established the Defense Science and Technology Agency to execute defense technology functions. DSTA collaborates with both local and overseas partners, including tertiary institutions and defense research and development agencies, to strengthen Singapore's defense technology.

The fourth workshop, held in September 2005, focused on cost risk and transformation issues. On cost risk, DSTA presented the evolution of the Mindef Life Cycle Management System, and IDA presented a risk management case study and described the history of the DoD weapon systems acquisition process and the recently adopted “evolutionary acquisition” system. The discussions on transformation concepts centered on a C2 team collaboration experiment and a C2 knowledge system.

The focus on defense management and transformation continued in the fifth workshop, held in September 2006. On defense management, IDA discussed using manned aircraft system cost estimating relationships for estimating costs of unmanned systems, and DSTA presented Singapore’s total ownership costs of select air

vehicles. Discussions on transformation in action featured IDA’s Terrorist Perspective Project, multinational experimentation, and the Singapore command post of the future. Workshop sessions related to full spectrum engagement included discussions of Southeast Asian regional security, America’s national response to Hurricane Katrina, manning a reconstruction and stabilization civil response capability, terrorism in Southeast Asia, and an IDA Horn of Africa study.

The exchanges continued with a sixth workshop in September 2007. The slate for that meeting included continued discussions of defense management, including identification of cost drivers in selecting systems and comparisons between the Singapore and U.S. acquisition systems. In addition to the workshop series, IDA and DSTA in 2006 began to collaborate on a year-long joint research project.

Intellectual Outreach to the Muslim World: The Council for Asian Terrorism Research

by Richard Porterfield

All of the major strategy documents guiding efforts to counterterrorism emphasize the importance of broadening U.S. partnerships with governments and civil societies in the Muslim world. These strategies place special emphasis on relationship- and capacity-building in countries that share with the United States a determination to neutralize the threat from violent extremist movements. In an address to the RUSI Conference on Transnational Terrorism in London in January 2006, Ambassador Henry A. Crumpton, the State Department Coordinator for Counterterrorism, stressed that “dealing with this threat demands that we build trusted networks capable of withstanding [terrorist] threats through partner-led operations that address real-world conditions. It means an emphasis on regional cooperation to address enemy safe-haven and cross-border flows of people, money, ideas, and technology.”

The cornerstone of U.S. counterterrorism policies and public diplomacy is the long-term effort to undermine, marginalize, and isolate the enemy by creating trusted networks that empower legitimate alternatives to extremist ideologies; to immunize civil societies against the ideological influence of terrorist and violent extremist ideologies; and enable multilateral, regional, partner-led responses to terrorism, insurgency, and ideological extremism whenever possible.

Over the past two years, IDA has conducted a series of engagements with counterterrorism experts across the South and Southeast Asian regions. This engagement began with a symposium on the “Landscape of the Terrorist Threat in Southeast Asia” sponsored by IDA, the Southeast Asian Regional Centre for Counterterrorism (SEARCCT), and U.S. Pacific Command’s Joint Interagency Coordinating Group for Counterterrorism (JIACGCT) that was held in Kuala Lumpur in April 2005. By the end of the three-day conference, a clear consensus had emerged that IDA, SEARCCT, and other academic and counterterrorism centers in the region should form a steering committee to

establish a permanent council to institutionalize the interdisciplinary and cooperative international spirit that had emerged in Kuala Lumpur. The steering committee met in Jakarta, Indonesia, in July 2005 and drafted a Charter for the Council for Asian Counterterrorism Research (CATR), which was later endorsed and signed by representatives of its founding organizations.

CATR consists of government, academic, and research institutions dedicated to providing systematic ways of promoting and sharing regional research on terrorism and counterterrorism in the South and Southeast Asian regions. Its membership, which now includes institutes from Afghanistan, Australia, Bangladesh, Indonesia, Malaysia, the Philippines, Singapore, and Sri Lanka, has regular participation from India, Japan, Nepal, and Pakistan. The Council’s goal is to draw on the unique strengths and perspectives of its member institutions and



Council for Asian Terrorism Research Board of Governors at the March 2007 conference held in Manila.

regional experts to enhance both understanding of and responses to the rise of terrorism and political violence. CATR was founded on the principle that by promoting and sharing research, it is possible to draw on the diverse expertise and perspectives that exist across the South and Southeast Asian regions to develop new approaches, enhance existing capabilities, and build integrated and cooperative efforts to counter terrorism in the Asia-Pacific region and other regions that directly affect its security.

A guiding principle of IDA's engagement with CATR is that regional, partner-led approaches to countering the spread of terrorism and political violence are vital to U.S. counterterrorism efforts. For this reason, IDA places a strong emphasis on facilitation rather than guidance and on creating and promoting opportunities for intellectual exchange and cooperation between academic and research institutions across the South and Southeast Asian regions in an effort to build partner capacity for multilateral, regional cooperation.

For IDA and its U.S. government sponsors, CATR is a groundbreaking exercise in strategic listening. Rather than using the CATR forum to promote and disseminate U.S. views and interpretations, IDA treats participation as an opportunity to collect and disseminate the views of local and regional experts of the threats, challenges, and opportunities presented by the continuing effort to undermine the hold of violent extremist ideologies on their societies. This emphasis on listening, facilitation, and cooperation has been the key to CATR's success. This model of intellectual outreach – with or without the creation of

a formal institution like CATR – has great potential to support U.S. public diplomacy and influence-building in other key regions and communities across the Muslim world.

The IDA team has facilitated five successful biannual CATR symposia, the most recent of which was held in November 2007 in Malaysia. These symposia bring together representatives of government counter-terrorism centers, strategic analysis institutes, military research centers, staff colleges, and major secular and religious universities, along with prominent academics and journalists from across the region with the goal of promoting bilateral and multilateral cooperation in understanding and responding to the local and regional conflicts – whether religious, ethnic, or socio-economic – that terrorists seek to exploit.

The value of CATR and its products to the overall U.S. counterterrorism and public diplomacy efforts is significant. The biannual conferences provide new and unique insights into the local and regional terrorist threat complexes from the perspective of the local forces and authorities whose primary mission is to counter them. Through CATR, IDA is facilitating cooperative and comparative analyses of the roots of terrorism; the nature and motivations of terrorist organizations and their leaders; the structures of operational, financial, and ideological safe havens; and the varieties and relative success of local approaches to countering terrorist movements and their violent ideologies.

Inside North Korea

by Kongdan Oh Hassig

North Korea's development of weapons of mass destruction (WMD) has been a major national security concern of the United States since the late 1980s. In January 2003, North Korea became the only country ever to withdraw from the International Atomic Energy Agency's Nuclear Non-Proliferation Treaty; it began in August of that year to boast openly of its nuclear deterrent. The threat escalated further in October 2006 when North Korea announced that it had successfully tested a nuclear device.

The U.S. government devotes considerable technical effort to monitoring the development of North Korea's military and WMD capabilities. Because North Korea is a closed society, however, it is difficult to obtain the kind of information about regime intentions, decision-making processes, and high-level domestic politics that are key to understanding the full nature of the threat a nuclear-armed North Korea presents. It is clear that the regime cannot exist without full military support, making the regime's military-first policy and pursuit of WMD matters of regime survival that are deeply ingrained in North Korea's political culture and not likely to change soon.

With this reality in mind, the goal of IDA's Inside North Korea project is to gain the best understanding possible of how the elites of the reclusive North Korean regime think. Because outsiders lack direct access, the thinking of elites must be inferred from observations of North Korea's broader political culture: the life and work of the policy elites, the relationship between the Korean People's Army and the Korean Workers' Party, and the means Kim Jong-il uses to control the elites and the masses. Such observations provide insight into the systemic problems facing the regime and the forces driving North Korea's WMD development. IDA is examining these relationships as well as shifts and trends in North Korean society to understand what the country's leadership must do to stay in power and how those necessities might, in turn, shape its strategic behavior, particularly its pursuit of nuclear weapons.



North Korea's Kim Jong-il with his military leaders.

Over several years, IDA has monitored the North Korean media; surveyed foreign analysis of North Korean affairs; and interviewed North Korean defectors, paying particular attention to activity along North Korea's border with China. China is North Korea's major trading partner and foreign aid benefactor: thousands of North Koreans travel to China each year on business, and similar numbers of Chinese travel to North Korea. Interviews with these people coupled with observation of the trade flow between China and North Korea provide valuable insight into how the North Korean people and their regime survive in a hostile economic environment.

The United States has made no measurable inroads in weakening the regime, changing its behavior, or turning the North Korean people against their leaders. North Korea is a proud, homogenous country where nationalism and cultural tradition remain strong even in the face of a collapsed economy and failed social policies. Secretary Kim Jong-il remains firmly



North Korean guardshack along the Tumen River facing the Chinese border.

in control of all branches of the government, adamantly opposed to any significant political and economic reforms, and staunchly committed to a military-first policy and the development of nuclear weapons. North Korea's isolation has bred a deeply-held bunker mentality. The regime, moreover, has gone to great lengths to plant suspicion and hatred of foreigners in the popular mindset. The Kim regime and the broader North Korean society feel genuinely threatened by outside events and pressures, especially what they regard as imminent American political and military threats. As difficult as life is under North Korea's current economic situation, most North Koreans would still prefer living under the current regime to taking their chances in a capitalistic society dominated by foreigners (which, in the North Korean mind, includes South Koreans).

The future strategic significance of North Korea is not solely dependent on its internal affairs. In the last half dozen years, China's economic influence has spread throughout North Korea, and with the demise of the former Soviet Union and Eastern European bloc, North Korea has become economically dependent on China. To a lesser extent, South Korea has also become a strong supporter of the North Korean regime, a stance that has from time to time put it at odds with the United States. IDA's analysis also provides deeper understanding of the policies of the government of the Republic of Korea,

Monitoring the U.S.-Republic of Korea Alliance

The United States-Republic of Korea (ROK) alliance forged after the Korean War has served a valuable purpose for more than half a century. Like most long-term political relationships, however, the alliance has begun to show signs of age. Faltering confidence and a decline in mutual respect have created a semi-crisis, as many South Koreans have come to believe that the active anti-proliferation, anti-terrorist policies of the United States pose a greater threat to peace on the Korean peninsula than do the economic, political, and military posturings of North Korea.

In early 2005, the U.S. and ROK governments launched the Strategic Policy Initiative to update the alliance in light of the security threats of the post-9/11 world, restructure the U.S. presence on the Korean peninsula, and adjust command relationships within the alliance. DoD established an unofficial advisory body, the Policy Research Group (PRG), to support the official negotiations and to assist in developing policy options. Supported jointly by IDA and the National Defense University's Institute for National Strategic Studies, the PRG concluded that, although the alliance remains vital to the national security of the United States and South Korea and to the peace and security of the Korean peninsula, the alliance needs updating to ensure its continued smooth functioning.

the sentiments of the South Korean people, and the degree to which the international and domestic pressures they create are likely to affect and shape the North Korean regime's strategic conduct in the near future. Foreign policy changes in China and South Korea may trigger social and political changes in North Korea that could sweep aside the Kim Jong-il regime and its military-first policy in the long term, but until that time comes, North Korea and its weapons of mass destruction remain a dangerous reality and threat to the security of Northeast Asia.

Red Teaming for Terminal Fury

by David A. Rosenberg

Each year the U.S. Pacific Command (PACOM) conducts a major training exercise, called Terminal Fury, to test command and control capabilities and prepare PACOM personnel for western Pacific major contingency operations. To improve the fidelity of the exercise, PACOM's Director for Intelligence (J2) has developed a Red Team capability that presents PACOM forces with an adversary operating across the spectrum of diplomatic, information, economic, and military power.

In the fall of 2006, an IDA Red Cell supported PACOM J2's standing Red Team. This Red Cell was composed of IDA personnel with extensive experience and substantive expertise in national and military intelligence; Asian diplomacy, history, politics, and culture; physics and weapons design; operations analysis; and information operations and technology. Three IDA staff members served temporarily in Hawaii during the exercise and an additional seven supported the exercise via secure communications from IDA's Virginia facility.

The role of the Red Team was to predict the perceptions and reactions of adversaries, allies, and neutral nations and groups to Blue Team (U.S.) decisions and actions during the exercise. Its particular focus was on factors related to the development and assessment of PACOM's strategic communications capabilities. Participation in various working groups and cells enabled the Red Team to provide insight into adversary, allied, and neutral perspectives in order to inform and facilitate decision-making by PACOM's senior leadership. The team also contributed directly to senior PACOM leadership deliberations by briefing its views as part of the PACOM J2's Commander's Daily Assessment.

In 2003, the Defense Science Board characterized Red Teaming as an important means of identifying "the range of options available to potential adversaries." The Red Team for Terminal Fury was not part of the OPFOR (Opposing Force). The OPFOR, which was played by the White Cell, had visibility into PACOM's staff and its own strategic objectives for the exercise, and knew the script and where the exercise was heading.

As the Red Team also did not perform intelligence assessments in the traditional sense, it had to distinguish its role and products from those provided by the PACOM Joint Intelligence Operations Center. To do so, the Red Team focused its attention on adversary thinking, rather than adversary actions. Defining itself as "Blue's Red," the team's goal was to provide provocative, complex, and culturally realistic characterizations of the adversary's likely thought process to PACOM's staff as it fought the OPFOR. To do this, Red Team members contributed to the daily deliberations of PACOM's various strategic planning boards and cells. The team placed particular emphasis on advising the Strategic Communications Steering Group and Theater Assessment Board on how best to get Blue's messages across to the adversary and regional partners, and which factors to consider when evaluating the effect Blue's actions were having on the course of the conflict.

Across the board, PACOM staff, from intelligence and logistics to plans and operations, responded positively to the Red Team effort in Terminal Fury. Joint Forces Command deemed it one of the best Red Teams the evaluators had seen and named the PACOM J2 Red Team model a Best Practice. In light of this assessment, IDA and PACOM will be expanding their unique Red Team activities in the future.

Promoting Interagency Cooperation in Shaping U.S.-China Relations

by Ashley Bybee and Edward Smith

As China's economy grows and its influence in Asia and the world expands, it is increasingly in the United States' interest to encourage China's emergence as a responsible stakeholder in the international community. With the goal of promoting constructive U.S.-China relations, IDA has helped OSD and the U.S. Pacific Command (PACOM) organize and run workshops called Promote Cooperation. The biannual workshops convene participants from 10 U.S. government agencies and entities actively involved in managing the U.S.-China relationship. The workshops promote interagency communication and broaden understanding of the nature, interests, and direction of each agency's stake in the U.S. relationship with China.

The first workshop focused on identifying the most pressing issue for each organization with regard to the evolving U.S.-China relationship. The discussions focused on the following issues:

- Each organization's key objectives and ongoing activities as they relate to U.S. – China relations.
- How those objectives and activities might be better integrated within and across agencies.
- Important conflicts, inconsistencies, or gaps in issues and activities.
- Interagency coordination mechanisms that could enhance effectiveness of U.S. government efforts.

Workshop participants recommended the following:

- Agencies need to improve collaboration at the planner-level by sharing databases and exchanging information. Although OSD might be willing to take the initiative to coordinate such an effort, the participants agreed that another agency

would be more appropriate to lead such activities.

- While each U.S. government agency performs valuable work, the lack of overall coordination and the absence of a grand strategy for dealing with China undermine their effectiveness. It is important that the U.S. government formalize a guiding strategic framework, most likely under the National Security Council, that should include policy and high-level guidance, clear objectives, a set of expectations that identify desired end states, and a commitment to bilateral discussions.
- The intelligence community should conduct a predictive strategic analysis of the U.S.-China relationship five years into the future.
- Participation in exercises, such as PACOM's Terminal Fury, should be expanded to include more Joint Staff representatives and other agencies.
- The Departments of State or Commerce should develop a strategy for improving understanding, synergy, and awareness between the U.S. and Chinese private sectors.
- Vehicles for ensuring informal working relationships should be enhanced to synchronize and de-conflict efforts within the U.S. government and improve information sharing.

A second workshop six months later expanded on earlier discussions, focusing in particular on improving the U.S.-China interagency dialog. Agency representatives discussed processes and collaborative mechanisms that might improve interagency planning and coordination in dealing with the U.S.-China relationship during crises.

Participants identified a number of potential implementation measures, reviewed and assessed metrics, and attempted to define the scope of people, funding, and other resources required. Follow-on discussions considered specific implementation measures designed to enhance interagency coordination. Workshop recommendations included the following:

- Improve communication on strategic issues across agencies by sharing crisis plans to better understand each other's roles, creating a calendar of events on a collaborative website to keep all organizations informed of each other's activities, and inventorying departments' current capabilities and activities.
- Enhance the current interagency process by constructing interagency working

groups, each with a specific focus, that would present findings to senior leadership on a regular basis; and use scenarios involving interagency participation as an effective approach to trigger discussion and focus on interagency issues.

- Encourage expanded participation by designating other agencies to co-sponsor future Promote Cooperation workshops, hence enabling them to shape future themes.

The Promote Cooperation working group has played a significant role in enhancing understanding, facilitating dialog, encouraging formal communication, and sharing information among U.S. government organizations that are involved in shaping U.S. relations with China.

Extending Trilateral Cooperation

by Ashley Bybee and Edward Smith

For several years, IDA, in cooperation with Japan's National Institute for Defense Studies (NIDS), has been examining issues related to the U.S.-Japanese security alliance. This effort has recently expanded to include the Korean Institute for Defense Analyses (KIDA), which has joined IDA and NIDS in a series of workshops that address how to contend with various North Asian regional contingencies. In addition to developing policy insights, these workshops serve to foster working relationships between defense policy officials and military officers from Japan, Korea, and the United States.

Workshop participants have included senior-level officials from the defense organizations of each country. The Korean team includes representatives from the Korean Emergency Planning Commission, the Joint Chiefs of Staff, and the Ministry of National Defense. The Japanese delegation includes representatives from the Joint Chiefs of Staff, the Ministry of Defense, the Japanese Maritime Self-Defense Force, and the Military Medicine Research Unit of the Japanese Ground Self-Defense Force. The U.S. contingent includes representatives from the Office of the Assistant Secretary of Defense (Homeland Defense and Americas' Security Affairs), U.S. Northern Command and U.S. Pacific Command, observers from the Joint Program Executive Office for Chem/Bio Defense, and other interested U.S. organizations.

Dealing with Disaster

The most recent round of trilateral talks, *Extending Trilateral Cooperation in Dealing with Disaster*, built upon two previous workshops to create opportunities for information sharing, training and exercising, and developing collaborative mechanisms. The group focused on military roles and capabilities in support of overall national objectives in the case of a

hypothetical outbreak of the Avian Flu. The group:

- proposed specific actions for enhancing collaboration and implementing cooperative measures,
- agreed on the best means and most practical ends in the tripartite military efforts to deal with disaster,
- prepared to implement, within the next six months to a year, a modest collaborative program among the three partners that focuses on responding to a future Avian Flu challenge, and
- scrutinized other ways in which future military trilateral collaboration might be useful in preparing for a disaster.

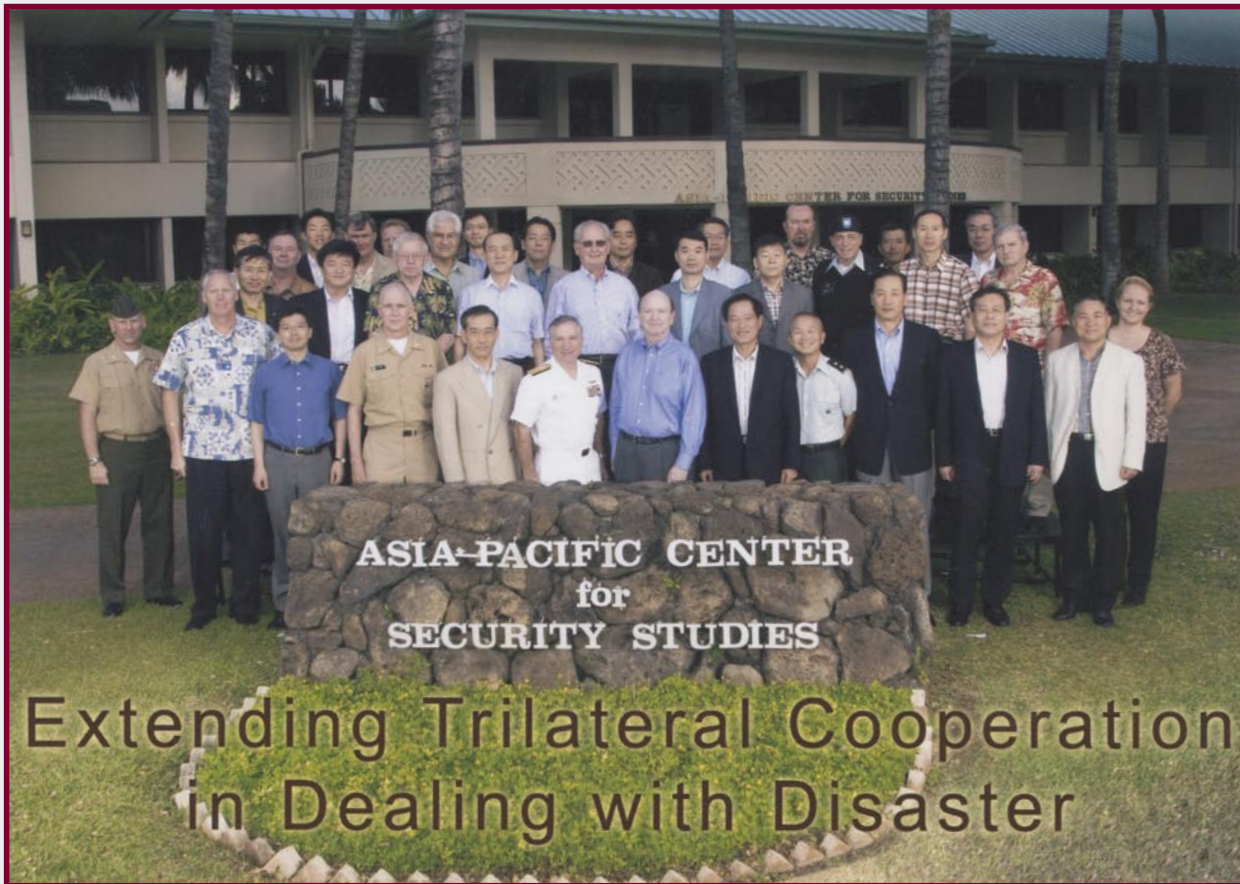
Participants, working in smaller country-specific groups, discussed information sharing, training and exercising, collaborative mechanisms (virtual and actual), and planning and implementation. In this context, they discussed the national implications of engaging in certain cooperative activities while addressing realities presented by their individual national disaster management structures. More generally, these workshops provided a mechanism for enhancing tripartite collaboration in response to disaster, with particular focus on military roles and capabilities.

Next Steps

The three national delegations recommended establishing a trilateral collaborative mechanism that would include an Organizing Committee (OC) to oversee two working groups – an Information Sharing and Portal Working Group, and an Issues Working Group. They recommended that the OC comprise three or four representatives from each partner

nation and meet quarterly over the next year. In addition, the OC or its working groups would meet “virtually” on a regular basis between meetings in support of overall national objectives. The strategic goal of international cooperation is to enhance U.S. and partner capabilities for homeland defense and security

in order to protect the national security of each country as well as collective security. IDA seeks to strengthen allied contributions to collective security, learn from the expertise and experience of foreign partners, and in so doing, enhance capabilities in other important areas such as counterterrorism and maritime interdiction.



Delegations from IDA, KIDA, and NIDS meet at the Asia-Pacific Center for Security Studies in Honolulu, Hawaii, for a trilateral conference on dealing with disaster on February 22-23, 2007.

Developing Human Capital in China – Implications for the United States

by Bhavya Lal

In its efforts to regain its “*fuqiang*” (rich and powerful) status in the world, China is transforming rapidly from a centralized and controlled Soviet-style economy to a more autonomous, entrepreneurial, and market-based one. In recent years, the Chinese government has allocated more funds for research and development (R&D), supported international collaborations in science and technology, and provided incentives for foreign investment in R&D.

The Chinese government has designed its Seventh Medium- and Long-Term Program for Science and Technology Development (2006-2020) to reflect its newly reformed vision of addressing the research needs of a market economy, and many policymakers speak of the shift from made *in* China to made *by* China, emphasizing its shifting focus from manufacturing to design and innovation. China is attempting to reduce its dependence on foreign-owned technology by pursuing home-grown innovation and accelerating the transfer of these new innovations directly to industry.

The desired end-result is an emerging China with regions that have world-class industrial base, with the infrastructure, R&D capabilities, educational institutions, and a standard of living that is beginning to match those in the industrialized world.

These changes have caused concern in some quarters of the industrialized world, especially the United States, where the rise of China is seen as an automatic decline of the United States. As a result, many governmental and non-governmental entities are paying special attention to China, its innovation ecosystem, and in particular the science and technology environment.

In two recent studies for the Office of Science and Technology Policy and the National Science Foundation, IDA’s Science and Technology Policy Institute (STPI) examined the innovation ecosystem of the United States and compared

it with those of current and future competitor nations. Both studies, the first data-driven and the second site-visit driven, resulted in interesting insights about the rapid growth of emerging nations such as China.

Production of Engineers in China and the United States

Leading CEOs across the nation – from Intel Chairman Craig Barrett to Lockheed Martin’s former Chairman Norm Augustine – point out that China graduates almost an order of magnitude more engineers than the United States. Others have disaggregated data to differentiate between bachelor’s-level and two-year college degrees to show that the

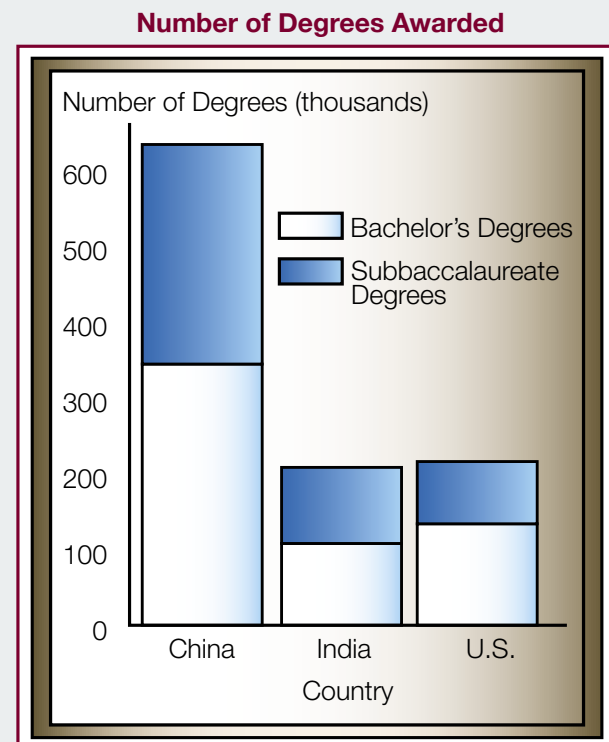


Figure 1. The number of engineering degrees awarded in China versus other countries of interest.

Chinese advantage is less substantial (Figure 1). Despite some disagreements about the production numbers, many stakeholders believe that the United States should produce far more engineers and scientists than it does now in order to sustain America's competitive lead in innovation (taking for granted unproven and implicit links between the number of graduates and competitive performance, without regard to other factors such as the population level, market needs, wage differentials across nations, and other complexities that guide the production of scientists and engineers in the globalized world). Based in part on such data, some members of Congress are asking for more science and technology education funding; in fact, most innovation bills in the 109th and 110th Congresses included provisions to increase the number of science, technology, engineering, and mathematics students in the nation.

While there is general agreement that China produces more engineers than the United States, our study found that there is little discussion of skills and quality of these graduates. Is it possible that most stakeholders are overestimating the quality of the foreign talent pool? Some recent studies propose that only about 10% of the 600,000 engineers graduating in China are of

comparable quality to the engineers produced in the United States. So perhaps the real issue is that of skills rather than raw number counts.

The IDA study found little existing data in this area. Much more needs to be done to explore the skills gap (rather than the numbers gap) with China. Would engaging in a numbers race against China work as it did against the Soviet Union during the Cold War years or with Japan in the 1980s? Many experts believe it will not because, unlike Russia or Japan, China and the United States are much more tightly integrated — bound together by the global market structure. All this leads many to conclude that to be competitive in the interdependent market ecosystem, the United States must promote engineering skills that complement rather than compete with China's.

Chinese Students Abroad: Brain Drain or Brain Circulation?

STPI studies of human capital in China also found that "brain drain" to other nations is a major challenge for China. The goal of these studies was to understand trends related to the return of foreign students and post-doctorates to

Number of Students 2000 - 2003

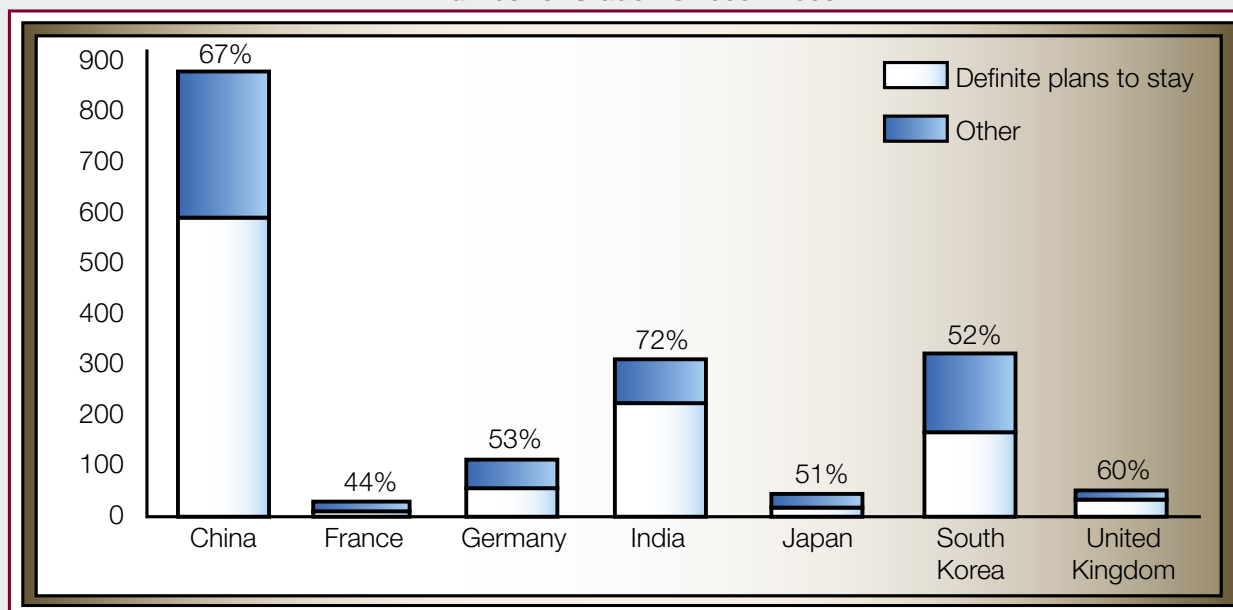


Figure 2. Foreign recipients of math and computer science doctorates from U.S. institutions definite plans to stay in the United States.

their home countries upon completion of studies in the United States (Figure 2). A parallel STPI study indicated that China recognized, and is making efforts to stem, a brain drain problem.

First, some data. In 2004, a total of about 400,000 Chinese students were studying abroad. More than two-thirds of those were in Europe (23%), the United States (23%), and Japan (20%), with the remainder in Australia or New Zealand and other countries (Figure 3). The best Chinese students were attending foreign universities, leaving China's top research institutes such as Tsinghua or Beijing University to compete for remaining talent.

In recent years, through programs such as the Hundred Talents Program, the Chinese government has begun to try to stem this brain drain by attracting talented returnees to China from institutions overseas. Lured by no-interest business loans and tax breaks in 2006, more than 40,000 returnees resettled in China, up from 7,000 in 1999.

During our site visits in China, STPI team members met one such returnee, or "sea-turtle" as returnees are dubbed in China. Professor Jing Cheng at Tsing Hua University completed his doctorate in Europe and received post-doctorate training in the United States before returning to China to establish the National Engineering Research Center for Beijing Biochip Technology (NERCBBT) at Tsinghua University. The Center is renowned both inside and outside of China, with revenues growing annually at 300%.

Eight patents from the NERCBBT were licensed in 2006, enabling it to start a new subsidiary firm - Aviva Biosciences - in the United States, further reinforcing the global linkages created by the NERCBBT. In addition, a small proportion of the start-up funds for Aviva came from Taiwan. The Center also funds activities at the U.S.-based firm Affymetrics for rights to market in China. The Chinese government has made encouraging the success of returnees a

Chinese Students Studying Abroad (2004)

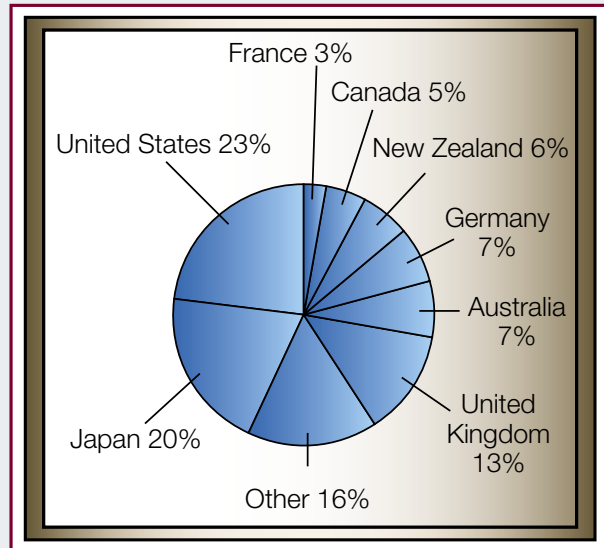


Figure 3. The distribution of Chinese students studying abroad.

priority and has taken steps to make the option more attractive for both young and experienced Chinese entrepreneurs.

The IDA site visit showed that economic growth and the development of China-focused networks of S&T researchers and professionals are as important as government incentives to attract expatriates. As China's wealth grows, research funding and academic infrastructure improve, and the networks within China become increasingly linked to the global scientific community, Chinese research institutions will likely be able to provide greater opportunities for scientists and engineers to conduct cutting-edge research. This in turn may have the effect of encouraging more S&T graduate students to stay in or return to China. The United States would certainly feel the effects: foreign students comprise a significant portion of both science and technology students and the S&T workforce in the United States, and immigrant scientists and many Chinese scientists and engineers have been extremely successful as entrepreneurs.

Nanotechnology in the Pacific

by Clifford Lau

Nanoscience and nanotechnology involve the research and development of microscopic materials and structures that range in size from 1 to 100 nanometers. When produced at this nanometric scale, materials, structures, and devices have vastly different mechanical and electronic properties than do similar materials produced at a scale visible to the naked eye. For example, carbon nanotubes have been shown to have greater tensile strength and elasticity than bulk carbon. Because they also have much greater electron mobility than graphite – another form of carbon – carbon nanotubes offer potential for developing very high speed electronic devices.

Nanotechnology is expected to have a major impact on future military capabilities. Potential applications include dramatically stronger and lighter-weight materials, along with ultra-sensitive and selective chemical/biological sensors, and high-speed information processing.

SCI Articles vs. Time

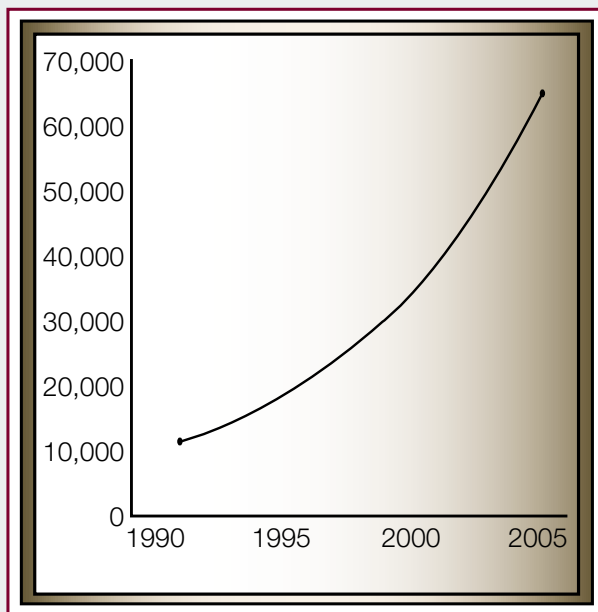


Figure 1. Total number of nanotechnology articles in 1991-2005 from SCI database.

DoD is investing more than \$400 million per year in various nanotechnology areas.

Worldwide investment in nanotechnology is close to \$4 billion per year. The Western industrialized nations and Japan are the dominant investors, but almost all developed and developing countries are investing at some level. Among those countries with substantial investments in nanotechnology are the United States, Japan, Germany, South Korea, France, the United Kingdom, Taiwan, China, and Australia.

IDA was asked to examine the quality and competitiveness of nanotechnology research in the Pacific region, with particular emphasis on South Korea and China. We employed text mining techniques to query the Science Citation Index (SCI) database, using about 300 terms relevant to nanotechnology research (Figure 1).

To get insights on trends in the quality of the research, we identified the most frequently cited nanotechnology articles from the SCI database (the top 1% of all the cited papers) from 1998 to 2003. We then developed ratios of the numbers of highly cited papers (CIT) to the total numbers of publications (PUB) from each nation and global institutions. A ratio higher than one means that a country's papers are cited often relative to the number of papers it publishes. For example, in 1998, the United States had a ratio of 2.33, which means that U.S. papers were cited 2.33 times more frequently than would be expected based on the number of nanotechnology publications alone.

Overall Trends

From 1998-2003, the U.S. produced roughly 25% of the total nanotechnology publications and 60% of the highly cited papers and maintained an average CIT/PUB ratio of about 2.5. Figure 2 presents a summary of the

Nanotechnology Article Production

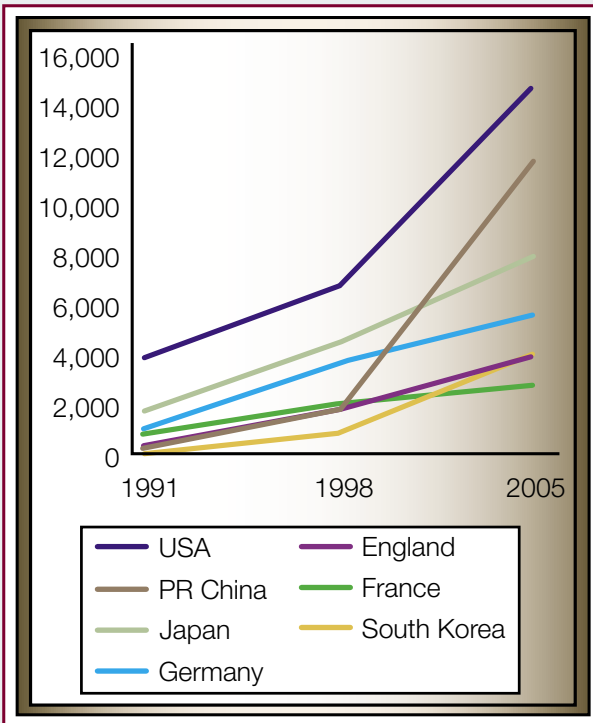


Figure 2. The breakdown of nanotechnology article production by country for three selected years: 1991, 1998, and 2005.

CIT/PUB ratios for the nine most important countries in nanotechnology publication.

No other country producing large numbers of nanotechnology papers had ratios approaching those of the United States (Figure 3). The CIT/PUB ratios of Israel (2.81) and the Netherlands (2.58) were higher, but both countries produced many fewer publications. The significance of their ratios, however, should not be overlooked as an indication of the high quality and potential impact of the nanotechnology research in those two countries.

China and South Korea

China and South Korea have significantly improved, with China's CIT/PUB ratio steadily increasing from 0.16 to 0.45 over the 1998-2003 period, while South Korea's increased from 0.11 to about 0.60. China and South Korea also climbed in rankings for the total numbers of publications during the same period from 6th and 9th in 1998, to 3rd and 7th in 2003. By 2005, China was 2nd and South Korea 6th in total nanotechnology publications.

Ratio of Citation Percentage over Publication Percentage

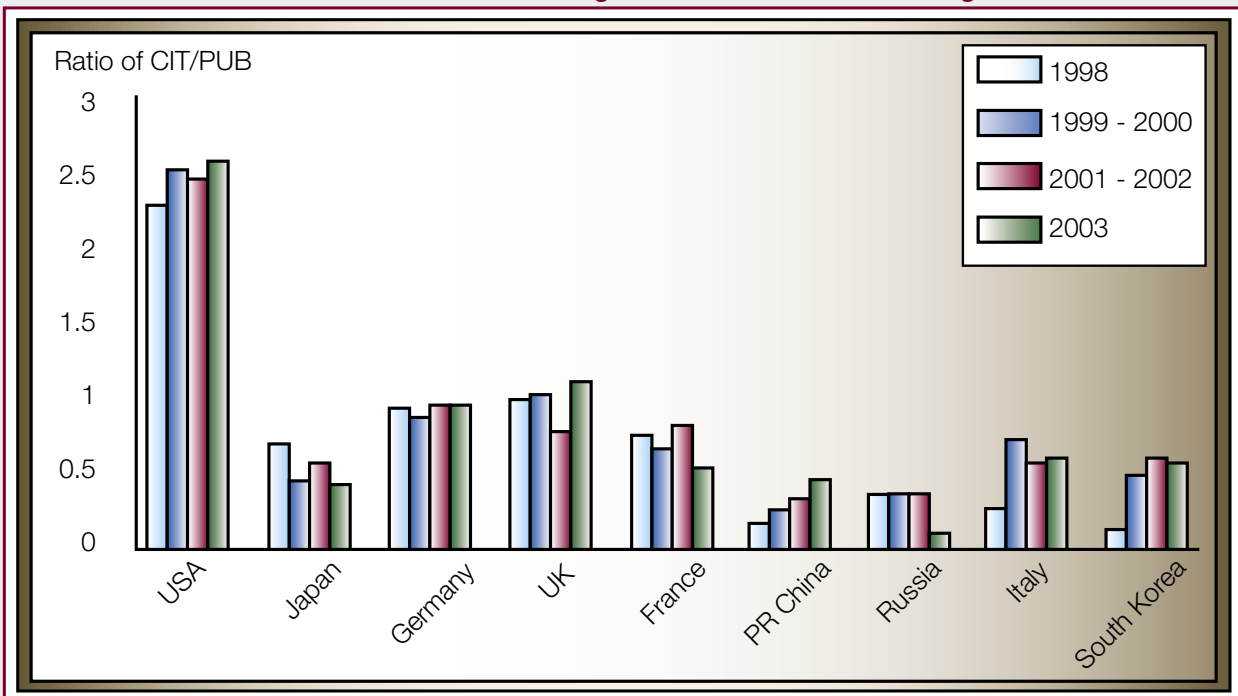


Figure 3. Ratio of Citation Percentage over Publication Percentage from 1998 to 2003.

Looking at China's 2003 nanotechnology publications by institution, the Chinese Academy of Sciences (CAS) produced the greatest number – about 30% of China's total. The CAS consists of a network of roughly 80 research institutes. What was more significant was the CAS's relatively high CIT/PUB ratio of 1.13.

The second tier of Chinese institutions in terms of CIT/PUB ratios included Tsing Hua University, Nanjing University, University Science and Technology China, Peking University, Jilin University, Zhejiang University, and Shandong University. Hong Kong institutions have, on average, also maintained strong CIT/PUB ratios, particularly the Hong Kong University of Science and Technology at 2.45 and the City University Hong Kong at 2.87.

In 2003, the South Korean institutions producing the most publications were Seoul National University and Korea Advanced Institute of Science and Technology. The next tier included Hanyang University, Sungkyunkwan University, Korea Institute of Science and Technology, Yonsei University, Korea University, and Pohang University of Science and Technology. The institutes producing the most publications also had the best CIT/PUB ratios, with Seoul National University at 1.69 and Korea Advanced Institute of Science and Technology at 1.53.

The study also sorted papers by technology areas based on keywords provided in the abstracts (Table 1). A majority of papers involved multidisciplinary materials science, applied physics, physical chemistry, multidisciplinary chemistry, and condensed matter physics.

Table 1. Publications by Technology Area

Subject	No. of papers
Material Science, Multidisciplinary	177
Physics, Applied	146
Chemistry, Physical	130
Chemistry, Multidisciplinary	109
Physics, Condensed Matter	107
Crystallography	41
Chemistry, Inorganic & Nuclear	37
Physics, Multidisciplinary	36
Physics, Atomic, Molecular & Chemical	33
Engineering, Multidisciplinary	21
Chemistry, Analytical	17
Electrochemistry	16
Material Science, Ceramics	12
Metallurgy & Metallurgical Engineering	10
Polymer Science	10
Material Science, Coatings and Films	9
Physics, Mathematical	7
Spectroscopy	6
Environmental Sciences	5
Chemistry, Applied	4
Engineering, Chemical	4
Multidisciplinary Sciences	4
Biochemical Research Methods	3
Engineering, Environmental	3
Electrical Engineering & Electronics	2

Surprisingly, no papers focused on either electrical engineering or electronics. Although many of the papers on nanotubes and nanowires focused on their applications in electronic devices, only two of the papers specifically dealt with electronics.

Overall, both South Korea and China have greatly expanded the numbers and improved the quality of nanotechnology research. These trends bear watching from the perspectives of industrial/technological competitiveness and military capabilities.

Selected Articles from Past Issues

Net-Centric Operations (Spring 2006)

- Joint Battle Management Command and Control Roadmap Study
- Estimating the Cost of Future C4ISR Systems of Systems
- Command Post of the Future
- Deployable Joint Command and Control System Testing and Evaluation
- Operation Iraqi Freedom Bandwidth Analysis
- Framework for Achieving Joint Command and Control Capabilities

Homeland Security (Winter 2005)

- Port Vulnerability
- Assessing the EMP Threat
- Homeland Defense Scenarios
- Transport and Dispersion Models
- IT Security

Research Notes (2000 – 2004)

Systems Evaluations

- AIM-9X: A Modeling and Simulation Success Story (2001)
- Assessment of Airlift Requirements (2000)
- COATS: A New Approach to Submarine Testing (2003)
- Integrated C4ISR Analytical Tool Set (2001)
- Naval Expeditionary Warfare Maneuver, Planning, and Execution (2003)
- Realistic Testing: Key to F-22 Mission Effectiveness (2002)
- Small Combatants: Implications for Effectiveness and Cost of Navy Surface Forces (2003)
- Surface Ship Radars (2003)
- Testing the Navy-Marine Corps Intranet (2003)

Technology Assessments

- Advanced Distributed Learning (ADL) (2000)
- Assessing the Future of the Global Positioning System (2000)

- Defense Electronics: Keeping the Edge (2000)
- Digital Representations of the Environment: Requirements, Representations, and Constructions (2000)
- IDA Support for the Global Combat Support System (2000)
- Militarily Critical Technologies Program (2004)
- Quantifying Military Information (2001)
- The MOUT ACTD Analysis and Technology Assessment (2000)
- Warfighters' Edge: Using Intelligent Agents to Solve Warfighter Problems (2002)

Resource and Support Analyses

- Cost Analysis for the Airborne Electronic Attack Analysis of Alternatives (2003)
- Cost Estimating for Next Generation Aircraft (2000)
- IDA Course Strengthens Acquisition Workforce's Understanding of Operating and Support Cost Analysis (2002)
- Idle Capacity in Aircraft Plants: How Much Is DoD Paying? (2002)
- Reducing Defense Infrastructure Costs (2000)
- Strengthening Defense Resource Management in Emerging Democracies (2004)

Force and Strategy Assessments

- Attack Operations against Critical Mobile Targets (2000)
- Crisis Management Engagement Activities in Southeastern Europe (2004)
- Enlarging NATO: Opening Options for Aspiring Members (2004)
- IDA Studies of National Security Organizations and Management (2000)
- Quadrennial Defense Review Analysis (2001)
- Regional Implications of U.S. Policy Options for North Korea (2004)
- Taking the "Revolution in Military Affairs" Downtown: A DoD Roadmap for Improving Capabilities for Urban Operations (2002)
- The Psychology of Deterrence – A Quantitative Model (2000)



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