

BLUE RIBBON PANEL ON FORWARD ENGAGEMENT
WASHINGTON, D.C. 20515

December 13, 2004

Joint Congressional Task Force on
Responsiveness to Future Challenges
United States Congress
Washington, D.C. 20515

Dear Chairman:

We are pleased to submit to you the attached "Interim Report of the Blue Ribbon Panel on Forward Engagement".

Upon appointment of the panel membership in September 2004, we began a review of the findings of past forward engagement panels. Previous panels looked at future issues in similar ways; however, we are the first panel to examine how members of Congress could better orient themselves to deal with these future issues. In order to adequately examine all relevant issues, we formed several working groups: Governance, Economics, Security and Science and Technology. These groups used prediction and projection techniques to forecast possible future issues pertaining to those areas. By determining the wide range of possible issues of the future, we are able to provide more effective recommendations regarding what type of Congressional organization could best tackle these issues.

This report explores the concept of "forward engagement," the complexity the future presents lawmakers, how Congress currently fails to address this complexity and suggests possible solutions for addressing future contingencies of interest. By doing this, we hope to improve the U.S. government's ability to track and react to events and trends that seem far off today, but may become current issues tomorrow. As a means institutionalizing this ability, the Panel recommends a Joint Forward Engagement Committee be formed to address the current lack of future orientation of existing Congressional committees.

This report should be read as a work in progress. Feedback is not only welcome, but requested. Our objective is to make government more flexible and agile, thus better able to respond to the issues that experts see on the horizon.

Please forward all comments and questions to the undersigned. We thank you in advance for your feedback.

Sincerely,

Caleb Patten
Chair

Enclosure

[SIMULATION: For Classroom Purposes Only]



Interim Report of the Blue Ribbon Panel on Forward Engagement

Joint Congressional Task Force on Responsiveness to Future Challenges

December 2004

[SIMULATION: For Classroom Purposes Only]

Blue Ribbon Panel on Forward Engagement

Panel Chair

Caleb Patten

Economics Working Group

Razili Datta, Samuel Frantz, Norman Getz, Ryan Russell

Governance Working Group

Kambiz Fattahi, Marina Kielpinski Shishniashvili, Shai Korman, Juliette Schmidt

Science & Technology Working Group

Mark Avnet, Evan Michelson

Security Working Group

Evan Haas, Bruce McWilliams, Caleb Patten, Rebecca Patterson, Joshua Vogel

Table of Contents

Executive Summary	6
Introduction.....	7
Why Forward Engagement?	7
What are Future Contingencies of Interest (FCIs)?	8
Example of a Prior FCI.....	8
Needs Assessment and Earlier Attempts	9
Univalence vs. Multivalence.....	10
Report Map	10
Complexity and the U.S. Congress.....	10
Energy Policy as a Case Study in Complexity.....	10
Institutional Recommendations.....	12
Goals	12
Basic Structure.....	12
Joint Congressional Committee (JCC) Structure.....	14
Staff Structure	15
Budgetary Process.....	16
Legislative Process.....	17
Methodological Recommendations.....	17
Feedback Mechanisms	17
Introduction.....	17
Feedback Definition.....	18
Feedback in terms of FCIs	18
Positive and negative feedback in terms of FCIs.....	19
Case Study: Governing at the Fountain of Youth: Extended Life Expectancy and its Challenges.....	20
Value Added by Incorporating Feedback Analysis	22
Conclusions.....	22
Component-Level Implementation Process.....	22
Comprehensive Buy-In Strategy.....	24
Introduction.....	24
Strategy Structure.....	25
Conclusion	29
Conclusions.....	29
Next Steps.....	31
Appendix I: Economics FCIs.....	32
Global Warming: A Creeping Future Contingency of Economic Interest	32
Structural and Theoretical Shifts in the Global Economy	35
The Elderly Hold Health Care Hostage – A National Interest Contingency	38
A Safe and Clean Method of Destroying Spent Nuclear Fuel.....	41

Appendix II: Governance FCIs	44
Will Russia Survive?.....	44
Nuclear Terrorist Attacks: Implications for Governance.....	46
The Global Grid.....	50
A Standing Army for the EU: Implications for U.S. Global Leadership.....	53
Appendix III: Science & Technology FCIs.....	55
Discovery of extraterrestrial life, past or present.....	55
Confirmation of a Grand Unified Theory (GUT) in physics	56
Computing power continues to rise exponentially.....	56
Discovery of a large asteroid on a collision course with Earth.....	57
Space exploration and utilization leads to the successful mining of resources from near-Earth objects (NEOs).....	57
A room-temperature superconductor is discovered	57
Nanotechnology becomes the “industrial revolution” of the 21st Century	58
Alternative energy sources, including wind, solar, and hydrogen power, become standard....	59
Environmental degradation continues around the globe, leading up to the potential for a major catastrophe	60
Medical advances redefine human life	60
Appendix IV: Security FCIs	61
Cyberstrikes: A Future Contingency of Interest.....	61
Space Arms Race	66
The Rise of Transnational Criminal Groups—A Threat to International Security.....	70
The Problems and Prospects of Private Military Corporations	72

Executive Summary

The United States Congress must keep pace with a growing number of far-reaching, complex, major developments. Issues such as genetic engineering, space exploration, nuclear terrorism, monetary devaluation, environmental problems, nanotechnology and quantum computing are all examples of emerging topics that will come to impact the country as a whole and, most importantly, will have far-reaching consequences over the long-term future. These developments are building and interacting at an ever-increasing rate and present a fundamental challenge to the Congress by spanning traditional boundaries of governance. However, by being myopically occupied with the political issues of today, Congress is not able to identify and track the precursors of these major events as they appear on the horizon. In short, having failed to be proactive, Congress is only able to react to the impacts of these events once they occur. This failure is compounded by the fact that these issues transcend sectoral boundaries (economy, governance, security and science and technology) as well, making decisions about how to respond more difficult. The Legislative Branch of government is an 18th century organization struggling to keep pace with 21st century technology. Congress must evolve to operate within this new, complex, accelerated world in order to preserve the sovereign power and representation of the American people.

Recognizing the need for Congress to prepare for, and react to, these complex events, the **Joint Congressional Task Force on Responsiveness to Future Challenges** convened the **Blue Ribbon Panel on Forward Engagement** in the fall of 2004. The Panel's mission was to make recommendations for how the Congress might best address future complexity. After using a variety of forecasting methods to develop a range of complex future events, known as Future Contingencies of Interest (FCIs), the Panel was able to ----identify way a set of institutional changes that could help the Congress address these oncoming set of concerns.

To this end, the Panel recommends the creation of a new Joint Congressional Committee to be known as the Joint Forward Engagement Committee (JFEC). This committee will be composed of representatives from both chambers of Congress. The committee staff will serve in an advisory role and conduct forward-looking research in ad hoc analysis teams that will be composed of experts assembled from both the public and private sectors. The committee's research will be aimed at the future, but conducted with an eye toward affecting short-term policy, thereby making it relevant to the day-to-day needs of Congress. In short, JFEC will help the Congress breakdown long-term concerns into more manageable components.

Through an aggressive public outreach program, the work of the committee will be accessible to a wide audience includes the Congress, the United States Government, and the public at-large. The goal of such research is *not* to advocate a particular point of view on an issue, or to support particular legislation. Instead, the aim is to rise above the partisan, political fights of today and take an eye towards the important issues of tomorrow that, ultimately, will transcend such political and partisan boundaries. While the committee will deliberate and ultimately decide on issues before the current Congress, it is imperative that its focus should always be kept on the future. It is the position of this panel that a new Joint Forward Engagement Committee is necessary to engage the rapidly approaching future that our nation will face and that such an institutional structure is the best way to help the Congress stay abreast of the rapidly changing that world we live in.

Introduction

The members of this panel have come together at the request of the Joint Congressional Task Force on Responsiveness to Future Challenges to make recommendations for a system that will equip the legislative branch to more effectively forecast and respond to developments that may become major concerns in the future. Our mission was borne out of the realization, made clear in the September 11th Commission's findings that the Congress has fallen behind the times and is not able to keep pace with our rapidly changing world. This limitation undermines Congress' effectiveness and results in reactive policies that may come too late. Our task was to make recommendations to create a body within Congress that will enable legislators to be more aware of and responsive to longer-term issues.

With this task in mind, this Draft Interim Report of the Forward Engagement Fall 2004 Panel (Panel) recommends the creation of a Joint Committee to conduct Forward Engagement. Forward Engagement (FE) is an analytical method for thinking systematically about the future, in order to enhance the capacity of Congress to respond to long-term events or circumstances. Forward Engagement utilizes effective forecasting mechanisms to identify contingencies that are likely to arise in a future time frame of approximately ten to fifty years. The process allows policymakers to be proactive—rather than reactive—to those situations can be reasonably anticipated. With better preparation for potential future challenges, policymakers can more astutely develop policy options and allocate resources for a number of critical future concerns.

Why Forward Engagement?

The pace of change has accelerated dramatically in the past century. As a result, major developments are occurring at a faster rate than ever before. Paradigm-shifting scientific and technological innovation, irregular and unfamiliar security threats, and unprecedented global economic interdependence have combined with rapid environmental change and restructuring social systems to present governments with challenges that require more sophisticated, flexible, informed, and effective policies, particularly when considering future concerns. Compounding these challenges is the increasing interconnectedness of issues: fields of study and analysis, particularly within the broad arena of national security, no longer fall into clean, distinct categories since they intricately impact one another at various points of intersection.

In its current structure, Forward Engagement constitutes the study of issues in four broad categories: Governance, Economics, Science and Technology, and Security. Each category encompasses an extensive span of issues and themes. The governance category involves issues that impact the form and substance of governance, such as a shift to more reliance on international institutions or the birth of a three-party system in the United States. Economics encompasses major changes or trends that have significant impact on economic systems including finance, business, or even national resources. Examples include a rising shift of global economic power to developing Asia or the collapse of the U.S. dollar. Science and Technology (S & T) includes developments in those fields that have far-reaching consequences, such as genetic modification to increase the human lifespan or the development of a space elevator. Security involves potential developments that will affect defense and military policy. Examples include a nuclear attack on U.S. soil, a space arms race, the disintegration of the Russian state, or

the implications of asymmetric warfare. At its core, FE recognizes that these four categories are highly interconnected. Developments in each area affect many other sectors in increasingly simultaneous and complex ways. Thus, the study of how major developments impact and are impacted by one another is an integral part of FE. As FE is still in the developmental phase, further analysis of these categories and potential additional areas of interest is welcome.

Although FE presently analyzes four sectors, the panel has identified a potential “fifth sector” that is equally important to consider as a driver of change – the Human Factor. This category addresses the insight that the integrated output of human psychology and sociology is a force of its own, rather than merely a derivative of the other forces described above. We describe this sector as the realm of culture, social interaction, values and mores that underlie human activity; these structures in turn drive developments in other sectors. The Human Factor is largely unexplored, and due to time constraints we only introduce the topic herein. We feel that it warrants further study, and urge future panels to incorporate the Human Factor into the final form of this report.

What are Future Contingencies of Interest (FCIs)?

Within each sector, Forward Engagement involves the identification and study of major future issues that will likely be of great consequence, issues that will have a profound effect on a system, structure, or condition within the global architecture. These events, situations, or developments can be described as those that will push other events, those that will be powerful enough to write the history of the future. Such issues can be called future contingencies of interest, or “FCIs.” In other words, an FCI is a situation that is likely to arise in the future that will have a major impact on at least one of the four or five principal sectors (governance, economics, science & technology, and security).¹ However, an overly simplistic definition of FCIs can be misleading; in practice, each of these fields is highly dependent on the context, or the other realms within which it exists. In an increasingly globalized world in which a push on one area can almost immediately result in a pull in another, it is nearly impossible for an FCI and its repercussions to be limited to a single particular policy focus; many FCIs affect all four or five sectors. Yet, to our detriment, the current systems of policymaking in the U.S. government are generally limited to linear or singular policy issues. These systems lack a mechanism that can anticipate specific scenarios to determine how they are likely to impact all sectors, and then develop complex yet valuable policy options to address them.

Example of a Prior FCI

September 11th is an example of a scenario that affected all four sectors on many levels. The use of planes as weapons on that day by terrorists has vastly altered the directive of policy through governance; has resulted in two wars affecting security in the U.S. and abroad; has reoriented and resulted in new advancements in and use of science and technology (through the development of systems to protect against future attacks, advanced surveillance systems, etc.); and has had a tremendous impact on the global economy. One can reasonably speculate that, had the U.S. government been engaged in policy analysis through FE prior to September 11th, the nation may have been either more consciously aware of the potential of such an attack, or better

¹ More detailed discussion of FCIs are available in the Appendices..

prepared to respond effectively to the events. The detailed and complex policies that could have emerged from an analysis of the intent and capabilities of enemies of the state, those that would so profoundly affect international security, the global economy, the American system of governance, and scientific and technological responses, may have not only prevented the events of that day, but could also have informed the need for additional policies such as the creation of a Department of Homeland Security, strengthening of immigration laws, injecting endurance into the global economy, and the need to focus scientific and technological progress on such similar issues.

Needs Assessment and Earlier Attempts

The U.S. government is ill-equipped to perform systematic analyses of long-range issues. The vast majority of decision-makers are overloaded with events unfolding today, and do not have the time, patience, or resources to focus on events that may be important ten or more years into the future. Unfortunately, this preoccupation with the present can not only blind decision makers to future events and render governments unprepared for critical situations when they occur, but can also further complicate future events in their short-sightedness. Many factors contribute to the inability of the U.S. government to address FCIs: 1) Planning, much less creating policy to address the unknown—the future—is a tremendously daunting task; 2) Research and other entities such as Congressional Research Service, General Accounting Office, the National Academies, and Congressional Budget Office are firstly unable to keep pace with the rate and complexity of emerging trends, but secondly are not necessarily mandated to anticipate and develop policy for the future; 3) the four- or six-year election cycle simultaneously constrains policymakers from taking action on challenging future issues, while also seemingly relieving them of such a duty; 4) the U.S. government tends to be averse to major change, either as a result of institutional entropy, or out of the inaccurate impression that policy and policymaking is a zero sum game; and 5) the conventional and somewhat logistically necessary separation of fields such as economics, governance, security, science and technology, and sociology contribute to the formation of narrowly focused policies that do not collectively tackle complex issues in a highly interconnected world and the complex situations decision makers face. The U.S. government needs to be able to plan for such possibilities far in advance in order to best manage the future as it unfolds. There have been attempts to meet this need in the past, the most relevant being the Office of Technology Assessment (OTA).

The establishment of the Office of Technology Assessment (OTA) in 1972 within the Congress represents an attempt to meet the need for comprehensive, in-depth analysis of technical issues of concern to legislators. It was intended to fill a gap left by the GAO, which monitors and evaluates ongoing programs, and the CRS, which performs quick research on legislative topics upon request. OTA was meant to look at longer-range issues in order to equip legislators with technical information necessary to craft policy for future contingencies. This mission is similar to the JFEC, but the JFEC is not a revival of OTA; its structure and output will be distinctly different. We have, however, used the structure of OTA as well as its demise in 1995 as a learning tool when designing the JFEC. Two key complaints about OTA led us to structure JFEC in such a way that it 1) produces timely, nonpartisan reports; and 2) the entire Congress will be aware of and have access to it.

Univalence vs. Multivalence

In discussing policies aimed at addressing FCIs, the panel uses the term “multivalent” to describe policy that incorporates the inherent complexity of FCIs, and the term “univalent” to describe policy that exists within an individual policy sector. The terms can be applied to not only policy, but to the attitude, culture and structure of an organization. Forward Engagement aims to employ and spread multivalent policies.

A similar analogy is presented by the criticism of the intelligence community (IC) following the September 11th attacks. The attacks were described as an “intelligence failure” because the various members of the intelligence community did not share information that might have been assembled into one cohesive threat picture. While

Report Map

This report will first cover complexity as it relates to long-range issues of concern (FCIs), the shortcomings of the U.S. Congress in addressing these issues. Next, we will detail the objectives, structure, responsibilities, and budgeting concerns for the proposed institution: the Joint Forward Engagement Committee (JFEC). In charting this organization, we will discuss some of the methodologies the JFEC should utilize in its approach and techniques. Finally, we will offer some concluding thoughts about the JFEC and FE. The appendices include examples of the FCIs developed in our study.

Complexity and the U.S. Congress

NEED COMPLEXITY DISCUSSION HERE

Energy Policy as a Case Study in Complexity

Continued global economic expansion depends on the availability of sufficient supplies of inexpensive, reliable energy. Therefore, any contingency that could greatly curtail or expand access to energy should be of interest to economists and economic policymakers. It is easy to see, however, that energy is far from a purely economic issue—the discovery, production, sale, and transport of energy affect and are affected by questions of governance, security, technology, and society. A comprehensive and proactive energy policy needs to account for these interrelationships, as they exist in the present and as they can be expected to exist in the medium and long-term future.

The security implications of energy are well-known. Geographically concentrated energy sources such as crude oil are vulnerable to political disruption, as during the 1970s oil shocks, and direct military interdiction. Countries and groups that control these supplies wield great power and invite potentially destabilizing challenges to their position, as when Saddam Hussein invaded Kuwait in 1990. The oil and gas-rich Spratly Islands in the South China Sea, claimed and occupied in part or in whole by five governments, are a more contemporary potential flashpoint. International security in strategically crucial regions such as the Middle East and Southeast Asia will be enhanced or threatened, possibly in unexpected ways, as the importance of oil and gas increases or decreases. A sophisticated American energy policy will recognize not

only that international security can affect access to supplies, but also that energy demand can affect security. There can be no clearer example than the spread of nuclear energy, a trend kick-started by the United States in the early years of the Cold War. While nuclear energy provides an alternative to vulnerable oil and gas supplies, and operates far more cleanly than coal, the resultant radioactive waste provides the raw materials for nuclear and radiological weaponry, and its environmentally safe storage remains a significant challenge. The kind of energy the world chooses, the quantity demanded, and the location and abundance of supplies are closely interrelated with international security and governance.

Meanwhile, science and technology partly determine what energy sources are available and how economically they can be utilized. Further, and as discussed above, as a determinant of supply and demand, energy technology has security implications as well. A cogent energy policy will therefore consciously take advantage of the linkages between technology and security, asking how technological development can have not only economic but also security benefits. The potential impact of energy technology on society and governance should not be overlooked, either. While climate change and air pollution can have clear effects on, for example, social organization in climatically-vulnerable agricultural countries and on governance in the urbanizing developing world, new energy sources could not only alleviate these issues but also enable new forms of social, economic, and political organization. Portable solar panels and fuel cells are already empowering farmers in remote areas of countries such as Mongolia and Nepal. Conceivably, such technologies could also be adopted by insurgent groups operating in similar environments.

The proportional significance of the United States in global energy production and consumption is rapidly diminishing with the rise of the Asian economies. Therefore, the possibility of international cooperation on energy issues should be explored. Further, the United States should consider how it might shape energy development in industrializing countries through investment, technology sharing, or other means. The international dimension of energy issues adds a new layer of complexity to the policy environment.

Crafting a comprehensive, maximally effective energy policy will require attention to economics, science, geopolitics, and area studies, for energy interacts with all of these areas. The Joint Forward Engagement Committee can assemble knowledge from across the disciplines to assist Congress in understanding the complexity of energy issues and how the United States can exploit this complexity in pursuit of American and global interests.

Institutional Recommendations

Goals

In response to the Joint Congressional Task Force on Responsiveness to Future Challenges' call to help Congress more effectively manage the complex and inter-related nature of the contemporary world, the Panel has concluded that a new institution is needed: an institution that, in the end, is capable of undertaking and handling three different kinds of tasks.

First, the institution must be able to use a variety of forecasting methodologies, such as scenario building and trend analysis, to spot Future Contingencies of Interest (FCIs) emerging “over the horizon” and inform policymakers regarding *what* the country as a whole may be facing in the future.

Second, it must be able to tease out a set of “bridging” issues—a set of open questions—that need to be addressed. For instance, this second stage would include analyzing such topics as: shortcomings associated with current governmental practices; problems emerging from existing laws or policies; potential barriers to successful policy implementation; and the recognition of “gaps” within the current structure of government. In short, this second step is designed to highlight the reasons *why* the current legislative or institutional framework cannot address the FCIs in the here and now, thereby having the effect of bridging the divide between the theoretical “what ifs” of forecasting to the actual policies and legislation required to address these FCIs.

Third, the institution must, at some level, be able to effect *how* decisions are made by way of influencing the lawmaking process. In other words, there must be a mechanism embodied within the institution that is capable of affecting the political system, including suggesting multivalent policies, dealing with partisanship, shaping legislation, and modifying the budget and appropriations process. Without such a political component, the institution will not be capable of actualizing the changes necessary to address the pressures brought on by the FCIs. By undertaking these three tasks—development of FCIs by way of advanced forecasting methodologies, identification of a set of open governance issues that need to be addressed, and becoming a “player” in the political process—the hope is that this institution will be able to integrate the perspectives of Forward Engagement throughout Congress and, in turn, help move it away from a mindset focused on developing static, linear policy towards the adoption of a mindset focused on developing dynamic, multifaceted policy.

Basic Structure

After careful consideration of a number of alternatives derived from research into past institutions and reform proposals, the Panel has concluded that the organizational option best designed to undertake these three tasks is the creation of a Joint Congressional Committee (JCC) to be known as the Joint Forward Engagement Committee (JFEC). The JFEC structure and functions would be clearly bifurcated between a professional supporting staff and the formal JCC, composed of sitting Members of Congress. The function of the staff—including both the permanent and temporary members—is to address the first two tasks of the organization; namely, using forecasting techniques to develop FCIs and identifying any “bridging” issues that affect the policy-making process. **For this reason, the output from the staff should be in the form of reports, letters, and analyses that provide “just the facts” related to the FCIs and**

“bridging” issues and stop short of advancing policy options or recommendations. To the greatest possible extent, JFEC’s staff should take every effort to guarantee that investigations related to these first two phases occur in a non-political, non-partisan environment. Along these lines, the staff should seek out future-relevant issues by encouraging project-proposal submissions from a number of sources and stakeholders, including the committee Members, other Members of Congress, interested parties, and the public at-large. By welcoming widespread participation, the aim of the staff is to collect, distill, and provide Committee Members with objective, “baseline” information that can then be used to inform the decision-making of elected officials. The output of the staff would be limited to providing research and issue identification for the legislative branch through the standing JCC.

In turn, the responsibility of the committee Members rests in the third phase, which relates to politics and lawmaking. The JCC itself would take the advice and recommendations of their staff, and as they see appropriate and politically feasible, introduce legislation to improve the capacity of Congress to better address longer-term issues that Congress will likely face in the future. Since the Members ultimately have the power to make decisions and influence policy, they are responsible for getting results and championing Forward Engagement in favor of the American public. **For this reason, the output from the Members is expected to be in the form of self-initiated legislation or policy recommendations and suggestions to other congressional committees and governmental bodies.** Clearly, the activities of the Members occur in the realm of politics, and, therefore, the Members will be tasked with ensuring that, even as compromises are made, Forward Engagement remains a high priority on the country’s, on Congress’, and on the government’s agenda.

The figure below illustrates this bifurcation of the responsibilities of each group - the staff and the Members - and highlights how their respective roles are different..

PHASE		
FORECASTS (FCIs) The “WHAT?” <ul style="list-style-type: none"> ● Scenario building ● Trend analysis ● Delphi method ● Prediction ● Projection 	“BRIDGING” ISSUES” The “WHY?” <ul style="list-style-type: none"> ● Problems related to existing laws ● Potential barriers to successful policy implementation ● Recognition of “gaps” within the current agency structure 	POLITICS AND LAWMAKING The “HOW?” <ul style="list-style-type: none"> ● Introduction of legislation ● Budget modification ● Policy implementation ● Political ramifications
WHO		
COMMITTEE STAFF <ul style="list-style-type: none"> ● Headed by Staff Director ● Four Deputy Directors ● Additional staff culled from Administration ● Experts organized along Sectors, led by permanent staff ● Forward Engagement Officers civil servant staff 		COMMITTEE MEMBERS <ul style="list-style-type: none"> ● Members decide ● Members ultimately responsible for results ● Represent the American People by adopting Forward Engagement

To establish this committee, we recommend that the leadership from both parties and both chambers introduce an item of legislation to institutionalize JFEC as a standing JCC, a body that would consist of Members of Congress from both the House of Representatives and the Senate. The idea for this JCC is in line with previous and existing bicameral efforts, including the Joint Congressional Intelligence Committee, the Joint Committee on Taxation, the Joint Economic Committee, the Joint Committee on the Library of Congress, and the Joint Congressional Committee on Inaugural Ceremonies. The purpose of institutionalizing JFEC as a JCC is to ensure that both the House and the Senate have an equal roll in engaging the future and participating in a newly designed, multivalent policy process that is intended to help reshape how Congress as a whole thinks about long-term policy issues.

Joint Congressional Committee (JCC) Structure

In particular, JFEC will consist of seven (7) Representatives and seven (7) Senators, with the majority party from each chamber holding four (4) seats and the minority party from each chamber holding three (3) seats. The majority party will appoint the Chair of the committee, and if any voting procedure ends in a tie, the Vice President of the United States will have the authority to break the deadlock. In order to holistically match the necessary forecasting and research functions of its staff with the policymaking process, the JFEC should be empowered to introduce legislation based upon the findings of its staff, and should be granted access to the Appropriations process as described below. Finally, due to its status as a standing JCC, JFEC

should be headquartered and apportioned office space commensurate with its committee and staff size in one of the House or Senate office buildings that surround the Capitol.

Staff Structure

Once the members of the JFEC are determined, a Staff Nominating Subcommittee (SNS), consisting of three (3) Representatives and three (3) Senators (with the majority party from each chamber holding two (2) seats and the minority party from each chamber holding one (1) seat), will be established to pick a Committee Staff Director (CSD). In their search for a CSD, the SNS should be encouraged to seek out nominations for qualified applicants from a host of sources, including the government, academia, private corporations, and think tanks. Once the CSD is chosen, this individual should be nominated by the House and confirmed by the Senate. In order to ensure for continuity and institutional memory within the staff structure of the JFEC, the CSD should be appointed to serve a ten (10) year, renewable term in that position. While this extended staff tenure may be unusual within the Congress—as staff members tend to turnover with the Members as per the election cycle—it does have precedence within the government, as it imitates the management procedures of the Governmental Accountability Office (GAO), whose Director serves a fifteen (15) year term.

The CSD will be supported by a series of four (4) Deputy Directors (DDs) that follow the four major tracks of Forward Engagement: governance, security, economics, and science and technology. It is also recommended that, as the organization matures, JFEC's directors should consider adding a fifth DD with a specific focus on “the human dimension” of Forward Engagement, a dimension that this Panel has noted as being systematically ignored in the past. The DDs should be appointed by the CSD and serve in staggered three (3) year terms. The CSD and each DD should assemble their own permanent staff of researchers and assistants, and particular attention should be paid to hiring qualified individuals that have experience working with relevant Administration agencies, including the Department of State, the Department of Commerce, and the Department of Defense. These seconded Administration staffers should serve a two (2) year term. The purpose of seeking staffers that have connections with the Executive agencies is to continue the tradition of including the Executive Branch in the Forward Engagement process. Because of their experience with a particular agency, the individuals who fill these permanent staff positions would serve as liaisons with their “home” agencies, in particular, and with the Executive Branch, in general.

In addition to JFEC's *permanent staff*—which would include the CSD, the DDs, and staff garnered from the Administration—JFEC would also support a *temporary staff* that would be assembled on a non-permanent basis and be comprised of experts from industry, academia, NGOs, and government. These Forward Engagement Experts (FEEs) would rotate through JFEC in varying lengths and intensity of service and are designed to advise JFEC's permanent staff on questions that require a particular expertise. This process of having expert FEEs participate “as-needed” is similar to the working style of the National Academies, in which experts are assembled on a *pro-bono* basis to offer their input and professional guidance. Though FEEs would be expected to serve their country without monetary compensation, their participation should be duly and prominently noted in any and all reports that JFEC produces.

Finally, once JFEC is able to establish Forward Engagement as an advisory tool for Congress, it is recommended that they should focus on training a cadre of Forward Engagement Officers (PANELs). PANELs would be a group of cross-disciplinarily trained civil servants capable of assisting other government agencies, departments, and advisory groups in thinking about and planning for the long-term future. Inspired by the existing cadre of Foreign Service Officers—which work diplomatically to advance the interests of the United States around the world—PANELs would become the “faces” of Forward Engagement before their respective organizations and, in turn, would ensure that JFEC becomes proactive in helping the government as a whole adopt a more future-oriented mentality. In addition, PANELs could become an integral part of JFEC’s public outreach by helping in a number of ways, including serving as leaders in town hall style meetings, offering public lectures, publishing articles, and presenting their work at professional conferences.

Budgetary Process

As the “power of the purse string” is arguably the most powerful tool of Congress, the Joint Forward Engagement Committee should be provided access to the authorizations and appropriations processes to ensure that planning for the identified FCIs is also considered when determining federal spending levels. Without some influence into the budgetary process, the fear of the Panel is that critical issues identified by the JFEC could easily go unheeded or without being properly acted upon in the interest of the American people by Congress. The standing members of the JFEC (i.e. the 7 Senators and 7 Representatives) shall have the ability to introduce authorizing laws to create, extend, or modify federal programs in order to better incorporate the tenets of Forward Engagement within the policymaking process. They can also work with other Authorizing Committees within Congress to provide advice and counsel on the future issues that existing government programs within their purview should take into consideration. As Authorizations are required under Senate and House rules in order for Congress to appropriate money to programs, the Panel feels that the ability to introduce Authorizing laws is necessary for Congress to be able to act upon the Committee’s recommendations.

The JFEC should also be reserved one non-voting seat on each of the 13 Appropriations Subcommittees and one voting seat (to be cast by the JFEC Chairman or his designee) on the overall Appropriations Committee in each House. The non-voting seats on the 13 Subcommittees would participate in deliberations, negotiations and drafting of Appropriations bills, but would ultimately not be able to vote on the final bill. Despite their inability to approve/reject the final Bill, their presence ensures that the JFEC’s views are infused into the Appropriations process. Furthermore, it will serve the other, voting Members of the Subcommittees to address the JFEC representatives’ concerns because the JFEC Chairman will, in fact, have a vote on the final Appropriations Bill at the Committee level, and incorporation of JFEC views could be a way to gain the ultimate support of that important vote. Exposure to the Appropriations Process will also help stir Congressional Members’ interest in serving on the JFEC, as it offers an opportunity to participate in budgetary decisions without formally serving on the Appropriations Committee. It will also further insulate the JFEC from future cost-cutting efforts since Members with Appropriations power would defend the Committee’s merit and would resist efforts to eliminate it.

As a means of injecting the forward-thinking efforts of the JFEC staff into the governmental budgeting process as a whole, seconded Administration members serving on the JFEC staff should participate in in-house Senior Budget Reviews conducted by their home agencies in order to provide a link between Congress (JFEC) and the Executive Agencies' budgeting processes. These individuals will serve as important liaisons between the two branches of government and will help provide for a more consistent approach to Forward Engagement throughout the government. Senior Budget Reviews occur early enough in the Administration's budgeting process that JFEC staff members' views can still be influential and their recommendations can still be incorporated as appropriate. Their roles also provide a good balance between discretion and information sharing in the often contentious Executive-Legislative budgeting relationship. Although Administration Departments would be hesitant to directly share with any congressional staff specific details of their budget requests prior to the President's final submission, via OMB, in February, it would be helpful for the JFEC to have a general sense of the Administration's plans. Departments could, in return, be assured that specifics would be unlikely to leak because the liaisons' careers paths remain within their agency, and over-divulgence of information could be ruinous for their career.

Legislative Process

The Committee staff, in its role of providing legislators with information on Future Contingencies of Interest and the issues associated with addressing these problems, can identify and initiate its own studies, can be mandated by the Committee Members to perform research, or, subject to a vote by the Committee, can undertake projects recommended by other Congressional Members, the Administration, or the public. After a study has been identified, the research and report writing should ultimately result in a largely balanced, non-partisan report to the Committee Members. Reports should be informative, but to the greatest extent possible, should avoid providing Committee Members with legislative recommendations unless directly asked to do so by the Committee. The Committee will take into consideration the reports generated by the staff, and as appropriate, should negotiate, draft, and introduce legislation on the floor of each House designed to address the reports' findings. Legislation can be in the form of an Authorization Bill, a Sense of Congress, or similar legislation designed to spur the Congress to more directly and efficiently address the challenges of tomorrow through more proactive governance today.

Methodological Recommendations

Feedback Mechanisms

Introduction

Multivalent policy makers have the difficult task of attempting to mitigate or strengthen the impacts of future contingencies of interest, while at the same time, taking into account the dampening and intensifying impacts of these events across multiple disciplines (security, governance, science and technology, economics). For example, how will the economic impacts of increased lifespan dampen the impact of this FCI (negative feedback) or intensifies it (positive

feedback)? A government response to an FCI may become a new FCI in its own right, bearing a new set of multi-nodal implications. Additionally, in today's international context, governments are in the unique position of being able to regulate activity in the science & technology, economics, human and security nodes, shaping impacts, yet also creating unforeseen side effects or feedback. It quickly becomes clear that tracking the multivalent effects of policies can be a daunting task.

To illustrate this challenge, the following case study looks at the nodal impacts of increased life expectancy and its own array of multi-nodal implications. Moreover, in an effort to integrate this concept into existing work on FCIs, feedback notations have been added to a matrix that demonstrates the impacts by node. This tool is extremely important for the PANEL that wishes to influence government actions and needs to consider the side effects of their proposed policy across all sectors.

This section is a living document that should be considered in future incarnations of the Forward Engagement and ultimately, incorporated into the norms of FCI analysis. The purpose of this section is to outline the terms and assumptions that will be used to incorporate feedback into FCI analysis, and then demonstrate how feedback works through a case study. We first provide the following definitions of feedback.

Feedback Definition

1. The return of a portion of the output of a process or system to the input, especially when used to maintain performance or to control a system or process.
2. The return of information about the result of a process or activity; an evaluative response.
3. The process by which a system, often biological or ecological, is modulated, controlled, or changed by the product, output, or response it produces.²

Feedback in terms of FCIs

1. Any reaction to a given FCI is feedback. These reactions can take the form of natural scientific phenomenon, policy decisions, social movements, violent uprisings, economic trends, etc.
2. In terms of FCIs, feedback does not necessarily have to return to the source.
3. Different strings of feedback take place simultaneously in both linear (within a single node) and lateral fashions (across all four nodes).
4. Any reaction to an FCI sends off both positive (enhancing) and negative (dampening) charges (feedback) throughout the nodes. Please note that in this case, the terms 'positive' and 'negative' do not correspond to 'good' and 'bad'. A 'negative' charge could easily be perceived as 'good' and vice versa. (These terms will be discussed in further detail under the next heading).
5. For every positive charge, there must be a negative and vice versa, though the corresponding charge may not be obvious or take place within the same nodal

² The American Heritage® Dictionary of the English Language, Fourth Edition
Copyright © 2000 by Houghton Mifflin Company.
Published by Houghton Mifflin Company. <<http://dictionary.reference.com/search?q=feedback>>.

relationship. Using the pyramid model for example, a positive development in the governance-economics corner, may lead to a negative development in the S&T-security corner.

6. Feedback Example 1:
 - a. S&T node: scientists develop the technology for stem cell research.
 - b. Feedback A within the S&T node: scientists are able to clone a human being.
 - c. Feedback B within the S&T node: scientists are able to create a model for perfecting organ transplants using cloned human body parts.
 - d. Feedback A within the governance node: the U.S. government legislates constraints on human cloning.
 - e. Feedback B within the governance node: in reaction to the cloned organ transplant model, the U.S. government invests in further exploration of cloning for the sake of saving human lives.

Positive and negative feedback in terms of FCIs

1. Positive feedback is a reaction that enhances the effects of a given FCI.
 - a. A pitfall of positive feedback is that if not constrained, it can enhance an FCI to a point of extreme instability.
2. Negative feedback is a reaction that dampens the effects of a given FCI.
 - a. Negative feedback will often repress the effects an FCI, only to see the FCI arise in another place. Since FCIs are inherently multivalent, trying to repress one will ultimately cause ripple effects in other areas.
3. Feedback Example 2 elaborates on example 1 (*additions to example 1 presented in **BOLD font***):
 - a. S&T node FCI: scientists develop the technology for stem cell research.
 - b. Feedback A within the S&T node: scientists are able to clone a human being. **This feedback is positive as it enhances the effects of the FCI.**
 - c. Feedback B within the S&T node: scientists are able to create a model for perfecting organ transplants based on the idea of using cloned human body parts. **This feedback is positive as it enhances the effects of the FCI.**
 - d. Feedback A within the governance node: the U.S. government legislates constraints on human cloning. **This feedback is negative as it dampens the growth of an FCI.**
 - e. Feedback B within the governance node: **the government bans cloning and creates a special task force aimed at inspecting labs and arresting perpetrators. This feedback is negative as it dampens an FCI.**
 - f. **Feedback C within governance: an underground of illicit cloning scientists develops. They perform illegal surgeries for high prices. This is positive feedback as the FCI is now enhanced. At this point, one might argue that this FCI has been enhanced to a point of instability.**
 - g. **Feedback A within S&T: the United Kingdom allows further development of cloning technology and human organ cloning becomes common. This is positive feedback. As noted in the definition of negative feedback, trying to repress the FCI in the U.S. allowed for the unintended consequence of foreign countries advancing the FCI.**

- h. **Feedback A with economics: the UK economy suffers because life expectancy rises to a point that exceeds resources. This is unintended negative feedback.**

Case Study: Governing at the Fountain of Youth: Extended Life Expectancy and its Challenges

The following sample case study is a preliminary attempt at adding feedback notations and is condensed in the interest of space. These feedback notations (+ or -) are meant to indicate where a given impact or policy will dampen or enhance the results of an FCI. Though feedback analysis is not yet fully developed, the new matrix is another step towards the incorporation of feedback analysis into the Forward Engagement Field.

Governing at the Fountain of Youth: Extended Life Expectancy and its Challenges

- Negative feedback, dampening impact on FCI (reduces global life expectancy)
- + Positive feedback, intensifying impact on FCI (increases global life expectancy)

FCI / Field	Science & Technology	Economics		Security		Governance		
GOVERNANCE								
Global Extended Life Expectancy - Life expectancy around the world rises	Vaccines and medications become more affordable and readily available throughout the world	+	Life extending procedures become available to the wealthiest countries and elites in developing countries	+	States enact foreign assassination policies as rogue leaders' are not expected to die off	-	Average life span of citizens in the developed world extends substantially	+
	Availability and quality of prosthetics technology expands	+	Worldwide economic strain due to aging population and increase in population	-	Military coups and insurgencies in authoritarian regimes become common as mid-range leaders become frustrated with lack of advancement and access to resources	-	Life expectancy gap between average citizens and elites in developing countries expands	+
	Cloned organ transplants become affordable	+	Life expectancy classes develop (elites live up to 50 years longer than poor)	+			Citizens become more invested in long-range planning for global issues, such as environmentalism, nuclear proliferation because effects will be felt in their lifetimes	+

Doctors become life expectancy expansion specialists	+	Resource and housing scarcity challenges countries with high population growth rates	-			Log jams of leadership as political leaders live longer and hold onto power longer (will have dramatic effects in countries with authoritarian regimes)	-
		Health insurance begins to cover life expectancy expanding procedures in developed world	+				
		Social security systems become strained by aging population	-				

Introduction:

As scientific advances make life extending procedures such as, cloned organ transplants and comprehensive cancer elimination treatments more common, and today’s medicines and treatments become more readily available, human life expectancy will rise throughout the world. As populations continue to age without dying off, the face of governance will be altered. However, impacts of this FCI will occur across all forward engagement nodes. Today, policy makers must prepare for governing longer living populations in the future. Multivalent policies that can integrate cross-nodal concerns will be crucial for the challenges posed by governing a longer living human civilization. Additionally, the multivalent approach should work to ensure that policies and the policy making process include mechanisms for managing and coordinating responses to positive and negative feedback that will occur as a result of decisions.

Structure and Scope of Analysis:

This case study offers multivalent policies that are threaded into two distinct, but interconnected themes – domestic restructuring and international coordination. In each section, multivalent policies are presented which are aimed at answering the questions posed by longer living populations. However, this discussion also finds that coordination of domestic restructuring and international policy is essential for achieving the multivalent synergy necessary for combating an FCI that will irrevocably change the international environment and spark a wide range of feedback.

Multivalent Policy Recommendations:

In order to brace the United States for a global rise in life expectancy, efforts must be taken to restructure American governance so that it can handle the impact of these changes. Other Western and developed nations will face a similar array of problems and will likely have to respond in kind. International coordination will be crucial for the success of policies. Examples such as an international mandatory retirement program, or international coordinated synthetic food production are multivalent policies which would help mitigate the undesirable consequences of a global rise in life expectancy. Significantly, these policy’s implications might seem paradoxical in that they generally cause positive feedback – life expectancy around the world will be improved through the innovation of synthetic diets, as well as the development of more employment opportunities and resources for disadvantaged members of societies. True, the ISNO and the mandatory retirement program will likely produce feedback which will in fact increase the impact of the extended life expectancy FCI. Individuals around the world will

live longer, healthier and more stable lives. However, the ISNO and the retirement program will also dampen some of the extended life expectancy's undesirable effects, such as global hunger and aggressive resource competition. A lesson-learned from this analysis is that policy recommendations may not always be able to realistically dampen an FCI. Policies may have to create positive or negative feedback in other areas and across other FCIs in order to stem the undesirable feedbacks generated by the root given FCI.

Value Added by Incorporating Feedback Analysis

By examining results in terms of negative and positive (dampening and enhancing) reactions, the outcomes of FCIs (though different qualitatively) can be reduced to a common denominator of analysis. Like the pyramid model, this should help policy makers visualize the complex interconnected impact of decisions and reactions to FCIs and help decision makers map the outcome of FCIs and feedback. It will also increase the chance that policy makers can develop effective multivalent policies because they will be more aware of the complex results of decisions as well as enable planning for possible unintended consequences.

Conclusions

With the addition of feedback analysis, since FCI impacts will be evaluated in terms of whether they dampen or enhance the effects of an FCI, this tool will allow policy makers to visualize substantively different results in a more uniform fashion – as positive or negative charges. Ultimately, the goal of adding feedback to this analysis process is to enable policy makers to go beyond tracking a single line of reactions. Positive and negative feedback awareness will force policy makers to seek out where opposite reactions are taking place for a given decision. By mapping the complex relationships taking place across nodes, policy makers will strengthen their ability to plan effective multivalent policies.

Component-Level Implementation Process

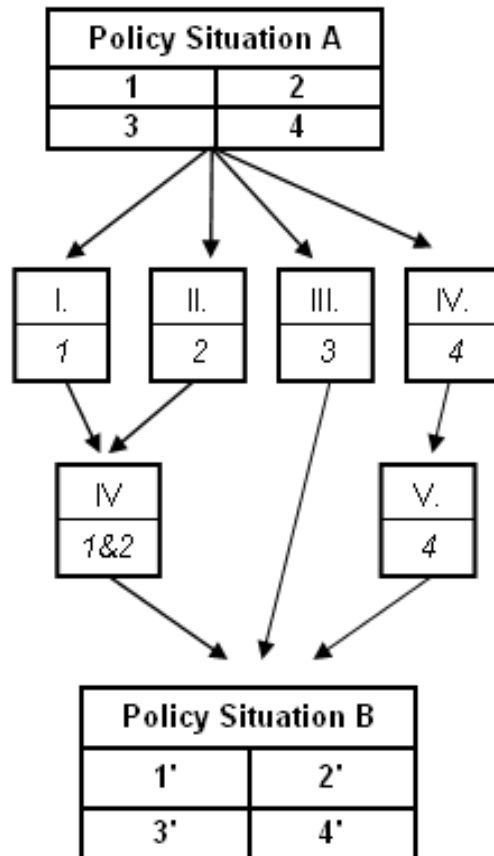
In general, policymakers are reluctant to consider long-term issues because the policy process is intimately tied to the relatively short election cycle. An individual Congressman or Senator would be taking a significant political risk if he or she introduced legislation to spend current dollars on issues whose outcomes will not be seen for a decade or more. Therefore, the JFEC must be able to recommend policies to handle FCIs without forcing any particular politician into the line of fire.

One of the primary roles of the JFEC is to examine long-term developments, break them down into nearer-term components, and then consider the broader relevance of those components. The members of the JFEC then will present the components as contemporary policy issues that the rest of Congress will see fit to consider during the same fiscal year or at least during the current election cycle. This approach, the Component-Level Implementation Process (CLIP), ensures that policymakers address the smaller and nearer-term pieces that comprise the larger-scale FCIs. Since each of these pieces will have a more immediate outcome, Congress will not spend large portions of the budget on long-term issues that may or may not be

realized. Instead, individual near-term policies will be implemented with the flexibility necessary to deal with the future.

The theoretical background for CLIP is provided by a fundamental computer networking concept known as packet-switching. Packet-switching is the process by which information is transmitted, transported and received over networks (including the Internet). Each file or message sent over a network is broken down into smaller "packets" of data that travel through the thousands of routers and switches that form the backbone of the Internet. Each packet is tagged with origin, destination, contents and various other meta-data. When the packets reach their destination they are reassembled into their original form. In this way, the Internet is able to break down the massive amount of traffic into smaller, more manageable pieces thereby making the overall system more efficient and stable.

CLIP employs this concept to describe and track complex multivalent policy through its smaller components. The packets can represent the individual policy components comprising a more complex policy. Instead of passing through routers unchanged, the components are modified along the way through various processes and milestones on their way to ultimately contributing to the final product. The following figure illustrates the concept where "A" is the current policy situation composed of 4 components. The Roman numerals represent the processes the components pass through on their way towards the target policy situation "B" comprised of four new prime components.



The U.S. Vision for Space Exploration, announced by President Bush in January of this year, is an example of current policy that attempts the CLIP approach. According to the Vision, the United States will return the Space Shuttle to flight so that it can be used to complete construction of the International Space Station (ISS). The ISS then will be used to study the effects of long duration spaceflight on the human body. This experience will be applied to human exploration of the Moon, which, in turn, will be used to determine the requirements for eventual human missions to Mars and “other destinations.”³ This approach, in which the ISS and the Moon are often referred to as “stepping stones”, is quite different from the one that was suggested fifteen years ago by another president.

When President George H.W. Bush announced the Space Exploration Initiative (SEI) in 1989, he established a goal for a human mission to Mars to take place in 2019. The way that this goal was stated caused politicians and the public to view the initiative as a single large program with a singular objective and an impossibly high price tag. On the other hand, the approach of the Vision for Space Exploration presents a more realistic way of working toward the goal of solar system exploration. Still, the Vision has faced a number of problems despite its deliberate approach similar to the CLIP framework. It seems that the primary reason for this is that the component-level approach is new to many members of the Congress and the public. Therefore, people often criticize the current Vision as a costly Moon-Mars program and do not fully realize that it is an incremental and deliberate attempt to make space exploration a reality. In order to avoid this type of misunderstanding, policymaking to deal with future developments requires that the CLIP approach become both institutionalized and accepted as a standard in the policy process.

Essentially, the CLIP approach provides a way to translate the discussion of future developments into the language of the current political system. Rather than focusing on the ambiguous effects of events that are far over the horizon, the CLIP framework determines the well-defined, near-term components of potential future developments and concentrates on making policies that deal directly with those components. The longer-term FCIs are considered in the policy process, but they are not the primary focus of attention. This approach helps to circumvent the “giggle factor” and actually makes current policy dealing with these FCIs more realistic. This approach has an important dual purpose. The resulting policies not only will serve the immediate interests of the constituents of Congressmen and Senators, but they also will help the country to prepare for the uncertainties that the future inevitably will bring.

Comprehensive Buy-In Strategy

Introduction

As indicated throughout this interim report, the PANEL will ask the U.S. government to alter the way in which it tackles policymaking. For the PANEL to effectively manage the complexity of long-term policy planning, institutions such as the Department of State, the Department of Defense and the Congress will have to work together in a tighter and more

³ National Aeronautics and Space Administration. *The Vision for Space Exploration*. February 2004.

symbiotic manner than ever before. Though the PANEL has a theoretically compelling mission, the task of attaining widespread institutional, bureaucratic and public buy-in cannot be overlooked. For the PANEL to succeed, a comprehensive buy-in strategy must be developed to foster the necessary sense of ownership in relevant actors. This section outlines a potential framework for gathering cross-institutional and public support for the integration of the PANEL into American policymaking process.

Strategy Structure

The buy-in strategy will be broadly aimed at helping leaders and citizens formulate answers to the following questions:

- What can be gained by engaging and supporting the PANEL?
- What will be lost by not engaging and supporting the PANEL?

Because this strategy aims to communicate with a broad set of audiences, it will require a multi-layered approach. For the purposes this interim report, a two-pronged approach is outlined across the following themes:

- Organizational change management
- Public affairs & civic engagement

Additionally, the two-pronged approach will be stretched over three temporal phases:

- PHASE I: Establishment & Initial Buy-in
 - This phase entails building support and ownership for the PANEL during the period between the legal establishment of the PANEL and it's official launch
- PHASE II: Lead in & Launch
 - This phase involves managing the buy-in and public introduction of the PANEL during the period before the institution is launched and during the initial period after the launch
- PHASE III: Long Term Buy-in
 - Long-term plan for maintaining buy-in and public support for the PANEL

PHASE I: Establishment & Initial Buy-in

Organizational change management

In order to ensure successful planning and implementation of this strategy, it will require an infusion of top-level experts who specialize in fields relevant to change management. The PANEL executive should select and head a change management leadership team with participants from the public and private arenas demonstrating professional proficiency in – but not limited to – the following fields:

- Change management
- Organizational / industrial psychology
- Systems theory

- Forward engagement
- Government bureaucratic structure
- Communications

The role of this team will be to spearhead the effort of building support across the various relevant government institutions. The leadership team will be charged with developing seminars, working with government leadership and overseeing the overall change management process. Specifically in the first phase, the change management leadership team will implement a series of seminars aimed at developing ownership among institutional leaders and working with them to create strategies for achieving buy-in throughout the government institutions that will be participating in the PANEL. The program's goals are as follows:

- Build a core group of leaders who lead the integration of the PANEL with their respective institutions
- Coauthor 'change management' programs tailored for each institution based on collaboration between institutional leaders and experts
- Foster a sense of ownership over the PANEL among government leaders who will be instrumental in the collaborative success of this institution

In order to achieve these goals, throughout the year leading up to the official launch of the PANEL, core leaders from all levels of the participating government institutions will be invited to participate in intensive seminars that will explore the importance of forward engagement and the integration of the PANEL. The seminars will be held in two series.

- The first series of seminars will explore change, forward engagement, systems theory, and challenge the leaders to look beyond the short-term.
- The second series of seminars will involve the government leaders, in conjunction with the experts, developing plans aimed at building 'buy-in' in their respective agencies

The purpose of organizing the buy-in program for phase I in this fashion is to systematically build support from core leaders by leading through a process of interactive learning. When they have completed their initial introduction to the PANEL, the government leaders will truly be able to 'own' the process of integrating the PANEL with their respective institution. By giving the leaders substantial control in crafting buy-in strategies uniquely tailored to their institutions, there will be higher chance of ownership throughout all levels of government institutions.

Public Affairs & Civic Engagement

Program goals

In this first phase, the PANEL needs to develop a public affairs and civic engagement plan to persuade political leaders on the importance of forward engagement and to gain support for the new organization. As many of these parties are beholden to public constituencies, these efforts need to convincingly explain how addressing potential FCI fallout can be sold to voters and ultimately, in a later phase, how citizens will be engaged to push their representatives to support the efforts of the PANEL.

In doing so, the PANEL will need to address why as an organization it is important to the future of American citizens and why they should use their tax dollars to support it. These messages should focus on key issues that result from FCIs, such as the medical or cost implications of increased longevity (a potential FCI), as opposed to focusing on the FCI itself. This public relations function would not be appropriate for the core PANEL staff and would therefore be outsourced to a professional public relations consulting firm. Examples of appropriate messaging may include:

- The benefits and challenges of stronger health and longevity for baby boomers.
- The domestic implications of a less influential and/or powerful United States in the international sphere.
- The outputs of simultaneous massive data crunching enabled by nanotechnology.

Under the direction of the PANEL public relations and change management directors, these types of messages will be customized for key influencers in Congress and institutional leaders who in turn will help educate and sell the program to others within the government.

PHASE II: Lead-up and launch of PANEL

Organizational change management

In this phase, the specially tailored change management strategies developed in Phase I will be implemented across the PANEL-related government agencies. Subsequently, trainings will be implemented for staff that will be rotating into the PANEL and interacting with the PANEL on a regular basis. Elements of the training will include topics such as, forward engagement, feedback analysis and systems theory.

Public Affairs & Civic Engagement

Program goals

In order to encourage pressure on elected representatives to support the goals of the PANEL and to encourage civic participation, the public will be engaged during the immediate lead-up to the PANEL launch through campaigns that explain the impacts of FCIs and complexity in ways that ordinary citizens can relate to, and in ways that don't overly sensationalize the subject in a way that would create undue fear. These campaigns will be driven by the outside public relations consultancy and will include products such as:

- An introductory mailer sent to all American households with an emphasis on issues of broad public interest will announce the first publication on an FCI selected by the PANEL for further analysis. It should point to the PANEL website & invite comment, educating citizens on the project and making them feel part of the process.
- A web-site with current projects and opportunity for comment from the public on each issue. The World Bank offers guidelines for creating online civic

engagement, and although their framework is geared towards the third world, some of their suggestions consolidate the best of e-government and provide a model that would work in the United States

(<http://www.worldbank.org/participation/web/webfiles/cepem3d.htm>).

- Regular press conferences and appearances by a trained spokesperson (ie: PANEL director of communications, press officer) introduce the program, take questions from press and keep the organization on people's minds.

PHASE III: Long-term PANEL buy-in

Organizational change management

During phase III, the change management teams will continue to monitor and implement the strategies put forward in the previous phases. Additionally, the leadership team will process the feedback about the institution and the change management process for consumption at the executive level. The information will be used for tweaking and improving the training and integration process of the PANEL. Not only will this ensure that the PANEL is an evolving institution, the processing of feedback will ensure that employees feel empowered as contributors to the growth of the institution.

Public Affairs & Civic Engagement Program goals

At this point, the PR strategy is further widened to maintain public support and buy-in in such a way that citizens will put sustained pressure on members of Congress to keep the PANEL on their platforms. Warnings about global warming and human cloning are not new and without compelling presentation, matched with a framework for considering complexity as offered by the PANEL, then this organization will share the same fate as its predecessors. Examples of projects at this stage may include:

- Education programs aimed at developing a new generation of Americans infused with a dedication to forward engagement, such as the implementation of "Caring for our Future" curriculum that will engage children at a young age, reinforcing the importance of FE in an enduring manner. In the same way that children of the late 1980s and early 1990s learnt to brush their teeth and recycle, this type of program will instill a sense of responsibility in the leaders of tomorrow..
- Upstream Public Engagement that looks at what it is important for citizens to know about forward engagement and American policy and focuses on the connections between FE and broad public interest through interest groups, polling and feedback mechanisms. This type of engagement has been used to educate and engage the public with some success in the science and technology field and with some small adjustments can be adapted for FE (<http://www.demos.co.uk/catalogue/paddlingupstream/>).
- Engage the public to play a game online, or participate in a simulation or discussion group which will not only give the average citizen an idea of the complex interactions in our current world, but may also feed new and creative ideas into the program. This type of online game has been designed for balancing the US budget and has generated some interesting results.

- A television commercial series will keep FE on people’s minds by showing potential futures in the style of current Microsoft commercials. These advertisements will superimpose a the world twenty or thirty years into the future on “your kids”, demonstrating the dedication of the US government and the PANEL to the safe and happy future of your family.
- Publications will be generated that capture the outputs of the PANEL, including forecasts and associated implications across all nodes for specific FCIs.
 - These publications must be easily accessible (online and print on request) and accompanied by a press release.
 - Don’t just say it, show it! Where possible, video clips of possible futures, graphics, illustrations, scenarios and storytelling should accompany any new publications.
- Market Successes
 - Regular press releases on successes, milestones or new research or innovation will keep PANEL in the news as a relevant, forward looking organization even in the short-term when forecasts are not yet proven.
 - Thought Leaders: Promoting PANEL as a source of knowledgeable spokespeople in each of its nodes will demonstrate both the superior minds in PANEL (both core members and experts who are pulled in for specific projects), and keep PANEL objectives in the press.

Conclusion

Incorporating a credible long-term forecasting strategy into the American governance structure requires a framework that combines change management with public affairs and civic engagement. Although this is only a working framework, which will be built in consultation with a public relations firm and input from key PANEL core staff, this type of outline will help with the acceptance and sustainability of the PANEL in an area of government that is highly resistant to change.

Conclusions

As part of its mission, the panel examined the capability of Congress to embrace the long-term, complex or fast moving policy issues proactively. Unfortunately, we found little evidence that the Congress possesses an overabundance of this skill, especially with regard to those policies that are boundary spanning or have multivalent implications. Furthermore, our analysis suggested there were several sources for this deficiency, some of them stemming from the organizational structure and role of Congress, and some of them from a culture that does not attempt to look very far ahead or reflect on the consequences outside a particular realm of policy expertise. This appeared to be true of the Congressional workforce at all levels.

The issues pertaining to Congressional structure and role we believe can be most effectively addressed by our recommendation for the formation of the Joint Future Engagement Committee. We also presume that by its formation, we will begin to solve the latter cultural problem, although this is expected to be more difficult and will require both a raised awareness of the problem and an active effort within Congress to correct it. Thus, our recommendations include

plans for building intra-Congressional consciousness and procedural change, as well as offer a number of methodologies that can be used by the JFEC and any other interested members, committees or staff. As part of this deeper problem, the task force recognizes that the day-to-day duties of a Congressman and their staffs make the ability to think beyond the near-term extraordinarily difficult. This, of course, means it will also require extraordinary effort to change these habits. However, the task force firmly believes that in this fast-paced and more dangerous world a more far-sighted approach is absolutely necessary.

In the process of formulating an approach to solve the organizational problems, we considered four alternatives. The first alternative was to reorganize the CRS to undertake longer-term forward engagement studies. The second was to reorganize the GAO in a way that would extend its current program analysis to forward engagement activities. The third possibility was the development of an OTA-like independent agency. And finally, the alternative we settled upon – the formation of a new Joint Congressional Committee. While not perfect in every aspect, this alternative showed the most promise for improving FE and being institutionally sustainable. The discussion of the pros and cons of each alternative below will illustrate the relevant factors involved in making this determination.

With regard to the first alternative, restructuring the CRS, its advantages were a function similar to FE and existing expertise. There was a major drawback to this approach, however. This effort had a political history. Legislation to introduce technology assessment in CRS was proposed not too long ago, and it failed. Our investigation revealed that the leadership at CRS felt such a restructuring would encroach on their budget, if not their role, and so were very opposed to it.

The second alternative of reorganizing the GAO to handle FE had a considerable institutional advantage. If the GAO director embraced the FE approach, any organizational form it took within GAO would probably be protected from any politically motivated budget cuts, due to the director's long 15-year term. At the same time, its functional fit would not be quite as good as would be with CRS. This is because FE, with its anticipatory analysis and products, are not that similar to GAO's principal output, which is current program evaluation.

The third alternative, the formation of an independent agency, would normally be a highly effective form of organization and would probably be the most objective. However, is not very insulated from the budgetary process. Furthermore, a proposal of this sort could meet with considerable political resistance. Again, history provides the guide. Although the OTA lasted 17 years, its demise indicates a weakness for this form of organization in the legislative branch during periods of heightened budgetary oversight. History also indicated this vulnerability could be increased by real or imagined overlapping of functions and report results are politically sensitive.

Consequently, we believe the formation of a joint congressional committee offers the best approach for making FE a part of Congressional thinking and policy-making. One of its most important attribute is its close connection with individual Congressmen. This should lead to a sense of trust in the analysis by providing them with some control over the output that ultimately

enters the political arena. From an organizational sustainability perspective, this closeness also provides it with considerable budgetary protection. However, it is not a perfect organization for FE *per se*. This closeness to Congress is likely to have a downside. There may be too much interference by Congressmen, who may want a say about such things as which FCIs are most important. This involvement might hamper the objectivity of the analysis. If, for instance, a conclusion about an FCI were to become too controversial, Congressmen might try to reach into the analytical process and harm an appropriate analysis. This might lead to premature foreclosure of analyses of FCIs with higher probabilities of occurrence.

Nevertheless, when the panel weighed this organizational alternative against all of the other alternatives, it found it to be the best organizational solution. It based this conclusion on the fact that there have been several attempts by Congress to develop better means for thinking ahead and most of these have come to naught. The usual source of these proposals failure was partisan rancor with the consequent swinging of the budgetary axe. Unfortunately, as we have discovered recently, the costs of not addressing multivalent FCIs can be very costly to both the country and to Congress itself. Thus, it is very clear that partisanship will have to be suspended if these recommendations are to be implemented in a way that will prevent the Congress from paying costs that are more exorbitant in the future due to near-term power struggles. Therefore, we believe that the formation of a joint committee is the most effective approach for mitigating this political problem, as well as being a highly effective conduit for the provision of timely and useful information to Congressmen who need to forwardly engage the future.

Once in place, the committee's permanent staff would apply the FE methodologies of Multivalent, Packet Based, and Feedback policy analysis in conjunction with an assessment of the human factors. These methodologies would not only be useful for the JFEC, but would be observed by analysts from other committees and agencies, who might in turn adopt them. This should lead to more forward thinking throughout the entire legislative branch and begin to address the more pervasive cultural problem of policy-making myopia.

The most important benefit from the adoption of these recommendations is their provision of foresight by uncovering and organizing likely scenarios on an ongoing basis. The organizational form is designed to present the most likely future scenarios to Congressman for policy background in a highly effective way. Because it will come through a joint committee, the initial bi-partisan reflection on these FCIs by the committee staff should vet the analyses and information in a way that will make it more trustworthy and actionable.

Finally, it should be remembered that the benefits of these recommendations might not just help avoid a national calamity. Once in place, these instruments of future engagement should be helpful in formulating policy for handling less cataclysmic, but equally difficult to perceive contingencies. Thus, we believe that these recommendations are worth the extra effort to put them in place and we fervently hope the U.S. Congress will adopt them.

Next Steps

This interim report continues the work of previous panels and recommends the following topics be explored by future panels:

- Further examination of the “Human Factor”.
-

Appendix I: Economics FCIs

Global Warming: A Creeping Future Contingency of Economic Interest

Razili K. Datta

The most commonly referenced effects of industrialization include rapid developments in transportation, production capacity, and technological innovation resulting in overall improvements to the quality of human life. Such changes demonstrate unprecedented progress. However, the severe environmental degradation caused by rapid industrialization as it has occurred (with few checks and balances), looms in the shadows of the industrial revolution. Global warming, one of the many manifestations of this degradation, has become a major contingency of interest for the future of the global economy. That global warming is a factually demonstrated phenomenon on Earth—one that is aggravated by human activity, and has occurred at a drastically accelerated pace in the past 100 years—is the leading assumption that provides the foundation for this exercise. In this paper, I will first present basic background information about the process, causes and effects of global warming. Next, I will demonstrate the potential future economic impacts of global warming as they will transpire in the coming century. I will conclude with a brief word about the urgency of this issue, and the policy implications of the alarming possibility of continued and accelerated global warming.

The ABCs.

Overview. Global warming is the term scientists coined to describe the increase in the near surface temperature of the Earth. While global warming due to natural processes has occurred for centuries, the term is most commonly used to refer to the climate increases understood to occur as a result of increased emissions of greenhouse gases.⁴ In general, scientists agree that the temperature of the Earth’s surface has increased by about one degree Fahrenheit in the last century. Furthermore, the Intergovernmental Panel on Climate Change (IPCC) has concluded that the increase in the Earth’s temperature is caused by increased concentrations of greenhouse gases, while a relative cooling in some regions is caused by an increased concentration of sulfate aerosols.⁵ As implied above, a detailed review of the scientific evidence of the occurrence of global warming, and of the argument that this trend is being exacerbated by human activity, is beyond the scope of this paper. However, I will take a moment to review the evidence of global warming, as it provides a glimpse into the consequences we can reasonably anticipate if global warming continues unchecked.

Past and Future. The effects of global warming span across ecosystems, regions, and time in a simple demonstration of the truly interconnected nature of the Earth. The following statistics provide an overview of the effects of global warming will likely continue along their current projection into the next century, most significantly, *at an accelerating pace*. According to the EPA, mean surface temperatures have increased by approximately one degree Fahrenheit since the late nineteenth century. The ten warmest years in the twentieth century have occurred

⁴ For more information, see <http://yosemite.epa.gov/oar/globalwarming.nsf/content/index.html>, <http://www.globalwarming.org/>, and http://www.ucsusa.org/global_environment/global_warming/index.cfm.

⁵ The United Nations Environment Programme and the World Meteorological Association founded the IPCC in 1988 to evaluate information in the scientific and technological literature related to all significant components of the climate change issue.

since 1985. Snow cover in the Northern Hemisphere and floating ice in the Arctic Ocean have diminished; the glaciers are melting. In addition, measurements show that the sea level around the globe has risen by two-thirds of a foot in the last century, and worldwide precipitation has increased by about one percent. Furthermore, the frequency of events of extreme rainfall has increased throughout North America. While seemingly mild, nonetheless, these statistics are deceiving. Increased industrialization, resulting in increasing concentrations of greenhouse gases, are likely to accelerate the rate of climate change in the coming century, and possibly even in the next fifty years. Though such forecasts are quite uncertain, scientists predict that the average global surface temperature could rise by up to 4.5 degrees Fahrenheit in the next fifty years, and up to almost six degrees in the next century. Global precipitation is expected to increase as the climate warms and evaporation rises, soil moisture is likely to decline, and extreme rainstorms will most likely become increase in frequency. Furthermore, along the U.S. coast specifically, the sea level is likely to rise two feet. Each of these shifts and their compound will have a domino effect on biodiversity of species around the globe, both through the proliferation of bacteria and diseases, and as a result of species extinction. That such predictions vary significantly by region is an important clarification in understanding and anticipating the impact of these environmental changes on the global economy. While this review of impacts of—and predictions for—global warming is by no means exhaustive, it provides fodder for discussion of the economic impact of global warming into the coming century. In the next section, I will analyze some of the economic implications of this future contingency.

Economic Implications.

The interconnected nature of global ecosystems has been mentioned above. While it may be misleading to segregate the economic effects of global warming from each other, it is beneficial to do so, in order to comprehend the impact. The following analysis explores the impact of rising global temperatures, and thus rising precipitation, the rising sea level resulting from warmer water, and the changes in global biodiversity independently of one another, in an attempt to fully explain the consequences. However, each of these areas is clearly and closely related to the next.

Rise in Global Temperature. A potential increase of up to 4.5 degrees Fahrenheit in average global temperature will have a profound effect on the global economy in the long term. The direct consequences to economic capacity due to changes in health, migration, and direct impacts of extreme weather only constitute a small piece of the effect on the economy. Furthermore, regional variance will play a major role in the economic impact of climate change. For example, sub-tropical and tropical regions will experience a general reduction in potential crop yields due to higher temperatures. To a lesser degree, regions in mid-latitudes will also witness decreased crop yields. Particularly for agriculturally based economies, such a decline in crops could be devastating to exports and food security, and thus to many national economies as a whole. Additionally, developing nations in warm climate regions, will experience exacerbated impacts due to water scarcity, exposure to vector-borne and water-borne diseases, and heat stress. The demand for energy for cooling systems can reasonably be expected to cause further strain on such economies. Additional impacts such as increased frequency of heat waves, droughts, famines, and wildfires will increase the economic toll of rising temperatures. Each of these effects can be projected for effects on investment, insurance and other financial services, industry, and social conditions.

The increase in global precipitation that will continue to result from increased evaporation due to warmer temperature will have damaging impacts as well. The most obvious

of these is increased flooding, which not only shuts down local economies, but also leads to varying amounts of financial burden (flooding in various parts of the United States has caused millions of dollars of damage), and deters investment. While a simplistic look at the net result suggests that increased temperatures and increased precipitation might cancel one another out, in actuality the regional variation global warming means that some areas will experience increased temperatures, droughts, and dryness, while others will face increased precipitation and its own host of problems.

Rise in Sea Level. As global temperatures rise, glaciers and ice caps melt faster, and quicker ice thaw in rivers and lakes hastens the onset of spring. The melting ice, along with thermal expansion of the oceans, leads to a rise in the sea level. The process inundates wetlands and other low-level areas, erodes beaches and coastal regions, and increases the salinity of bays, rivers, and groundwater. The potential for such shifts in sea level to wreak havoc on economic systems is tremendous. Initially, damage to coastal regions will create significant financial burdens similar to those described in the previous section. Eventually, however, the loss of land area will lead to inward migration from coastal areas, causing a strain, in some cases, on nearby locales that must absorb a growing population. This population squeeze, though gradual, will have implications for physical and social infrastructure, as well as local economies. For example, small developing nations such as Bangladesh with little cushion for shifts in land feel the impact of rising sea levels far more acutely than does the United States. Clearly, many of the impacts to economic systems such as the greater need for energy resources to address new problems, proliferation of diseases, and a detrimental impact on crops apply to the rise in sea level as well.

Net Changes in Biodiversity. Shifts in global temperatures, precipitation, and land/water composition will undoubtedly have a strong impact on distributions, population sizes and density, and behavior and survival capabilities of many species of wildlife, from plants and insects to mammals. Many species and populations are already at high risk, and will be placed at greater risk as a result of the climate changes. Some ecosystems in their entirety are expected to disappear. The disruption to global economic systems as a result of the corrosion of ecosystems and wildlife will be manifold. As mentioned earlier, the proliferation of new forms of bacteria as a result of changing climates, food and/or water scarcity, and the adaptation of species will introduce additional complications to the overall effects of global warming. Such bacteria, seen through the lens of an increasingly globally connected world, will travel to locations outside of their original or natural habitats, resulting in an increase in impact of diseases such as the West Nile virus. Furthermore, the lack of knowledge about or confidence in the capability of the human immune system to resist such diseases, combined with the extinction of species, limits the capacity of medical science to draw upon yet untapped resources for combating such illnesses. The economic impact of these circumstances is dismal. Damage to overall human health will limit the growth of the economic engine throughout the world. The loss of scientifically essential diversity in life on Earth will serve a blow to the scientific community, and the repercussion effects of these developments will echo throughout the global economy.

Global Economic and Environmental Systems.

In closing, it is important to revisit a few points that were mentioned at the beginning of this paper. First, the rate of global warming has increased significantly, and warming was greater during the twentieth century than at any time during the past 400-600 years.⁶ Evidence

⁶ "Global Environment: Global Warming," Union of Concerned Scientists, undated. Available at http://www.ucsusa.org/global_environment/global_warming/index.cfm.

of this fact is in the specifics: the Arctic ice pack has lost about forty percent of its thickness since the 1950s. The global sea level has risen about three times as fast in the past century as it did in the past 3000 years. Seven of the ten warmest years in the twentieth century occurred during the 1990s. In short, global warming is accelerating. Given the premise that a large contributor to global warming is human activity, increased industrialization, leading to increased greenhouse gases in the atmosphere, will only accelerate the rate of global warming in the coming decades. In other words, the remote contingency of global warming and its severe impact on the global economy is no longer so remote. Paradoxically, this acceleration may have at least one positive side effect—it should assist in giving global warming and its ramifications a place at the forefront of the international policy agenda.

Structural and Theoretical Shifts in the Global Economy

Sam Frantz

The post-World War II global economic order has been anchored in part by two related forces: the preeminence of the West and the power of neoclassical economic theory. Both of these conditions are slowly eroding, or at least transforming, thus creating critical but uncertain consequences for the United States and the world. This essay argues that two changes—the shift of economic power to Asia and the rethinking of neoclassical economics—are important trends in their own right, but that they may engage in a complex interplay of power and ideology that could truly reshape the international economic structure that, for the last sixty years, has been largely founded on America's terms. I will first consider these two shifts separately, as autonomous 'future contingencies of interest' (FCIs), before showing how their interplay allows us to conceptualize a meta-FCI that can serve as grounds for policy discussion.

Structural shifts: Rising Asia

Before the attacks of September 11, 2001, the rise of Asia, and particularly China, was the dominant topic of debate in international affairs. Although the world has since been distracted by the more immediate issue of global terrorism, the seemingly unstoppable march of the Asian economies has continued. Growth rates in the newly industrializing economies (NIEs) of Asia continue to greatly outpace the growth rates of the developed world. For 2004, the Asian Development Bank projects that growth for developing Asia as a whole will reach 7.0%, including an impressive 8.8% in China, 7.5% in Vietnam, and 6.8% in Malaysia.⁷ This is nearly twice the 3.6% growth rate that the advanced economies are expected to sustain in 2004.⁸ The discrepancy in growth between the developed world and developing Asia is the continuation of a long trend, a trend which is likely (though not certain) to continue for some decades. James F. Hoge, Jr., editor of *Foreign Affairs*, writes:

China's economy is expected to be double the size of Germany's by 2010, and to overtake Japan's, currently the world's second-largest, by 2020. If India sustains a six-percent growth rate for 50 years, as some financial analysts think possible, it will equal or overtake China in that time... Asia's rise is just beginning.⁹

⁷ Asian Development Bank, *Asian Development 2004 Update*, October 2004, p. 120.

⁸ International Monetary Fund, *World Economic Outlook*, September 2004, p. 3.

⁹ James F. Hoge, Jr., "A Global Power Shift in the Making," *Foreign Affairs* July/August 2004.

Importantly, Asian economies have not simply improved output but have also become increasingly technologically sophisticated, in some cases becoming sources, not just recipients, of technological innovation. This will allow Asian political and military power to grow along with GDP.

The structural importance of Asian development for the world economy is clear, says Robert Giplin, when we realize that “international affairs has become a participatory democracy.”¹⁰ Giplin asks us to compare the development of the Bretton Woods system with that of the World Trade Organization. The former system was negotiated in a few months by two men from Britain and the US, John Maynard Keynes and Harry Dexter White, respectively. The Uruguay Round, in contrast, took over a hundred countries nearly a decade to negotiate. In a multipolar economic world based on diplomacy instead of force, “any viable new international order must take into account the values and interests of these rising powers.”¹¹ It follows that the United States will increasingly have to make compromises in its dealings with Asian powers if it wishes to pursue multilateral global structures; the psychology of American leaders and the American people will need to adapt to a less-dominant position in Asia. The United States ought to be considering now how to approach such a shift in perspective.

Perspective, indeed, will partly determine whether America and other countries pursue primarily policies of global integration, or whether the emphasis will be on regional integration. Similarly, perspective will influence whether economic nationalism or economic globalism will triumph in the years ahead. How policymakers and the public think about economics will help determine the structure of national and international economies. However, as the next section discusses, the bedrock assumptions that have guided economic thought since World War II are beginning to crack. If the rise of Asia is changing the global economic playing field, developments in economic theory are beginning to change how the game itself is understood.

Theoretical shifts: Rethinking neoclassical economics

Stanford University economist David M. Kreps identifies three “canonical hypothesis” of post-war neoclassical economics: greed, rationality, and equilibrium. That is, economic theory has been constructed based on the assumptions that economic actors always seek to maximize their material welfare, that they possess “far-sighted rationality” with a “detailed probabilistic picture of the future in mind,” and that the market moves reliably and rapidly toward equilibrium among its variables.¹² The theoretical underpinnings of economics have stayed largely unchanged over the past two decades, and one might be tempted to interpret the recent stability as a sign that economics, having undergone rapid development in methodology and scope since World War II, has finally matured as a discipline. However, Kreps argues that there is actually a slow but accelerating “internal revolution” taking place within economics, in the form of intense attacks on the canonical neoclassical principles.

First, economists are increasingly making an effort to understand how economic entities—individuals, corporations, governments—actually act in the marketplace. Kreps explains that as economists have increasingly marketed themselves to corporations, governments, and other organizations as ‘applied economists,’ they have necessarily had to engage with markets as they behave in practice, with all their irrational tendencies. As

¹⁰ Robert Giplin, “APEC in a New International Order,” *Analysis* Vol. 6. no. 5, National Bureau of Asian Research (1995), p. 7.

¹¹ Giplin, p. 7.

¹² David M. Kreps, “Economics—The Current Position,” *Daedalus* (Winter 1997), pp. 59-85.

economics has become increasingly applied, the need to draw on fields other than traditional economic theory has grown. Instead of assuming “hyper-rationality,” economists are working with sociologists and psychologists to explain and model market behavior which, quite often, does not accord with economic rationality. Whereas economists once fought to escape the indeterminate nature of the other social sciences, they are now gradually being lured back. The re-engagement of economics with the other social sciences will be a major engine of economic theory over the next few decades. At least as important as the questioning of rationality and greed, however, is the fact that much of the most interesting work in economics is now being done not about markets in equilibrium but about markets in disequilibrium. This shift represents a fundamental change in the kinds of questions that economists ask and the answers that they find. To be sure, Kreps notes, there are economists who resist undermining neoclassical theory, but it seems inevitable that the canonical assumptions of neoclassical economics will gradually weaken as the field becomes increasingly ‘applied’ and interdisciplinary. What will emerge is not yet clear.

Max H. Boisot shares Kreps’ dissatisfaction with neoclassical economics. In particular, Boisot argues that traditional economic theory has difficulty accommodating knowledge as a focus of transaction rather than a peripheral supporter of transaction. Writes Boisot:

[Stanford economist Kenneth] Arrow has identified three areas in which information phenomena today pose a challenge to the neoclassical paradigm: (1) the economic relevance of non-price signals—i.e., information that is not captured in prices; (2) the costliness and economic value of information; (3) the differential possession of information by individuals. These phenomena all point in the same direction: towards a treatment of information as a focus for exchange and not merely as a support for it.¹³

Consider the difficulty that information-based transactions pose for traditional value theory. Economists’ current framework for equilibrium requires that we know the utility of the object of transaction and that the object be scarce. But to determine the utility of information, its content must be known, and when its content is known it is no longer scarce; knowledge, once released, cannot be retracted. When a customer buys a used car, in contrast, she learns as much about the content of the car as possible—its history, blue book value, mileage—but if she chooses not to purchase the car it merely stays on the lot. But “an information good incurs a loss of scarcity in the very process of having its utility ascertained,” meaning that its content must always remain at least partly unknown by the buyer (and the public) prior to the transaction.¹⁴ On accounting for this and other aspects of the information economy, Boisot thinks, neoclassical economics falls far short.

Thus, Boisot identifies the need for a “plausible economics of information.” Just as Newtonian physics “became a special case” amid relativity and quantum theory, so too must neoclassical economics, with its emphasis on perfect information and market equilibrium, be conceptualized as a special case in economics.¹⁵ The need is critical, for in chaotic systems “microscopic” discrepancies can have “macroscopic” effects and, as the information economy expands, there will be increasing discrepancies between the economy as it exists and the neoclassical theory through which economic policies are currently conceptualized.

¹³ Max H. Boisot, *Information Space: A Framework for Learning in Organizations, Institutions and Culture* (New York: Routledge, 1995), p. 21.

¹⁴ Boisot, p. 11.

¹⁵ Boisot, pp. 18-19.

If Kreps and Boisot are correct, the assumptions and models which have guided economic thought in the West since World War II, and which have spread globally since 1989, will be subject to fundamental challenges in the coming decades as economists study markets as they actually function in a knowledge-driven economy. The present debates over outsourcing and copyright law are merely the first, tentative shots to be fired in what will be a long struggle to retool neoclassical economic theory for a global economy in an information age.

A Whole New World?

The postwar global economic order was based on Western institutions and values, and was held together by fear of the Soviet Union (among the major capitalist powers), American preeminence, and the power of neoclassical economic theory. The collapse of the Soviet Union removed one incentive for economic cooperation with the United States, and the other two forces are beginning to erode as well. In the absence of economic and ideological hegemony, the United States is facing a world in which it no longer makes policy or even sets the terms of the policy debate. To some extent this is already happening, as evidenced by the near-collapse of the Doha round of trade talks. More profoundly, however, these structural and theoretical shifts raise the prospect that competing forms of capitalism could emerge, perhaps with particular regions endorsing their own variants. Some scholars argue that the collapse of the Soviet Union has allowed the rise of a new period of economic nationalism, in which old rivalries and new power imbalances are allowed to express themselves; presumably, nationalism and regionalism could be easier to maintain if the theories that once stood against them are perceived to be back in play.¹⁶ Further, strong economic growth in Asia will create new intraregional and interregional imbalances and tensions. These tensions will be resolved, cooperatively or not, partly on the basis of perception and ideology, both of which will be affected by changes in economic thought.

The United States must anticipate a future contingency in which, over the next several decades, the structural and ideological fabric of international economics is gradually shredded and reconstituted along new lines of power and theory, with uncertain outcomes.

The Elderly Hold Health Care Hostage – A National Interest Contingency

Norman Getsinger

It is generally agreed that the American health care system is a weakness in our societal development. Our system is certainly one of the most inefficient in the developed world, especially as compared to the systems of Europe and neighbor, Canada. Given then, assumptions about American leadership of the world community, our health care is a scandal. There are, unfortunately, a number of reasons for this state of affairs.

It is not the purpose of this writing to prescribe remedies. That, we leave to others. Rather, our purpose is to outline some basic reasons why we have gotten into this fix, and to suggest how a looming contingency - the convergence of America's forthcoming bulge of the elderly - will raise profound management questions for the American healthcare system. They are questions reaching to the allocation of life-giving services. The system must be in a state of repair that will permit answering these questions. It is a matter that requires forward engagement.

¹⁶ Gilpin, p. 10.

Ailing Healthcare

In its true sense, health care is a shared responsibility of the individual, the community, and the government. It has a moral element. Even further, health care is related to national security through factors such as its effect on military readiness and homeland defense. And the bottom line is that health care is a major national expenditure; an ever growing budgetary entitlement that defies discretion. How, then, have we gotten it so wrong? How will the health care system, in its weakened condition, respond to the challenge of the needs of the elderly who keep getting older and increasingly remain with us.

A primary problem is the American national attitude toward social expenditure. It has to do with national pride in individualism, in self-reliance. We like to think we are responsible for ourselves. The less government intrudes, the better. This element of the national character is as old as the country. And it has directly affected our reluctance to assign the government its proper role in the nation's health maintenance. Nonetheless, starting in the Franklin Roosevelt era, the sense of community responsibility has broadened to the point where we now have a broadly mixed public-private healthcare system. We may even be started down the road, already traveled by other societies, toward universal healthcare. But we have a long way to go, and we are not moving very fast.

Meanwhile, Medicare and Medicaid give the public exemplary government programs that bring millions of Americans under healthcare coverage. Even the Bush administration, not generally given to repairing social safety netting, has responded to political necessity by pushing expensive prescription drug coverage through Congress. Even congressmen concerned about diminished revenues from administration tax cuts, went along with the legislation because final costs were disguised in the presentation. Still the broadened coverage, intended to fill the healthcare gap, has failed to provide the prescription benefits so badly needed by the general public. Agitation for direct imports of cheaper U.S. drugs from Canadian pharmacies continues.

The drug manufacturers, who blanket evening television with appealing nostrums, are just one part of the vast private sector profiting from American healthcare. Drug companies sell to the American public at higher prices than they do abroad because their right to do so is protected by lobbying power. Powerful lobbies also protect the marketing power of insurers and of medical device manufacturers. Any effort to shrink the health industry private sector in favor of the public sector runs a well-defined political risk. Political Washington remembers how the Clinton administration effort to insert government controls ran afoul of the lobbies' media presentation of Harry and Louise sitting around the kitchen table and dismissing out-of-hand any widening of government responsibility.

True, the public-private joint effort has indeed given America the world's highest quality healthcare. It is also the most expensive, and benefits are badly distributed. Hospitals and treatment centers must employ the latest treatment modes and charge what the traffic will bear. The result is a multi-tier charge for services with government-insured paying the least and the uninsured charged the most. It doesn't work well. Within the millions of uninsured, there are thousands who can't pay treatment costs. They descend on emergency wards and intensive care facilities that must, in the end, absorb the costs. One reads often of hospitals that are forced to suspend emergency treatment because of losses to the uninsured.

Clearly, it is not difficult to find problems in our healthcare system, but we need to be constantly aware of them. The system is not broken, but it badly needs repair. It is in flux, and

will remain so, until we find a better balance between private and public responsibility for the nation's health. But we must find it soon. There is no part of the economy that faces steeper cost increases than healthcare. Yet the cost-benefit ratio is badly out of balance. And as we deal with expenditure and balance in the healthcare future, we must deal also with the almost incredible advance of medical science and technology that press the system forward before it has found its bearings.

The challenge of the advance of medical science and technology

Understandably, futurists are intrigued by continuing advances in medical science and technology that reach to conditioning life and extension of the lifespan. The pace of medical advance is quickened by the support of a stream of public and private funding. After all, it's about bettering life itself, and who could be stingy in that regard? And the scientists, toiling in their laboratories, feed their product into a market eager to absorb it. Not only do we continue to find new ways to broaden health maintenance and fight disease, but also bionics, the stuff of science fiction, finds practical application in development of replacements for worn out and malfunctioning parts of the human machine. To some, the pace of scientific exploration of human biology is going too fast and raises moral issues that have not yet been conclusively debated. Consider, for instance, the question of the propriety of probing human matter within stem cells. It has forced the Bush administration, sensitive to pro-life advocates, to take the equivocal position that it is permissible to pursue some stem cell lines but not others. There, we can only go part way.

The swift advance of medical science raises, too, the economic issue. It partners with the others and joins in the suggestion that we may be getting ahead of ourselves. Every new medical device is more complex and more costly than its predecessor. Its employment in a medical procedure raises exponentially the bill for that procedure. Who pays? Who can afford it? How can we adjust the healthcare system so that we can embrace, as we should, each new device that brings us along to a better life?

There is no greater challenge to the need for forward strategy in our healthcare future than the slowing of the aging process. It has given us a new population of aging elderly to care for. Discoveries of life enhancement have, in practice, already drastically changed the demographics of the aging process. It is the result of not just a single agent, a magic bullet, but of progress all along the frontier of public health that improves life quality. It is not a matter of stopping, or reversing the aging process. Aging is itself unstoppable, and death is certain. The fully bionic man remains in science fiction. But longer life is now available for many, and much longer life becomes available for many more in each generation. Centenarians are now the fastest growing segment of the U.S. population. There is evidence that those who have reached a very advanced age have a proven capacity for longevity. It follows that a healthy eighty year old may have a better ten-year outlook than the average fifty year old. So the eighty year old is part of the new assemblage of elderly oldsters that need expensive care for years.

The challenge of the elderly to the healthcare system is sharpened by the knowledge that the "baby boom" generation will enter their seventies in the year 2020. Very many "baby boomers" have grown up enjoying the advantages of modern medical science and will join the ranks of the older elderly. That prospect provides a time line to the need to ready the healthcare system.

The older elderly and healthcare

The convergence of the bulge of the elderly on an inadequate and struggling American healthcare system indicates a scenario, a future management crisis, for which we now need to explore answers. How will we cope? We are ill prepared for public debate on questions that conceivably include the question as to which of the elderly we can afford to keep alive. Since it is expected that the base cost of assisted longevity will be paid by the state, elderly care then becomes a governmental budgetary concern. Public policy makers may have to consider that it will only be possible to pay for just so many declining years out of the public purse.

Yet the decision about the elderly may not be so stark. The number to whom a longevity decision need be applied may be limited. There are many, many elderly who see they are over the hill; that their best years are well behind them. These oldsters feel they have had enough of the pain and suffering that comes with old age. They are ready to call it quits. For them, or if they lack cognizance, for those who care for them, the choice, if they are given it, would be death with dignity. Suicide, widely considered morally repugnant, is not an answer. Suicide denies dignity. But on the law books of at least one state, medically assisted life termination has already been approved. Under the growing pressures of elderly care, other states may find that they must follow suit.

Hospice, a growing movement with moral force, is another way out. Perhaps it could be combined with “right to die” legislation. Rather than prolonging life by countering terminal illness, hospice uses the potency of pain killers to establish conditions for a tranquil end.

But this leaves an elderly cohort, still vigorous, or at least determined to carry on, and quite unready for peaceful departure into the golden sunset. This cohort wants to take advantage of all the possibilities for extended life. For the independently wealthy in this group, there is no problem. They can try, even though they may not be able to buy a longer, healthier life. The state may be forced to decide for the others who are dependent on the state, just how much time, and for how many of them, extension of their life span is affordable. Perhaps the line can be drawn at those not terminally ill, who can be maintained by standard (not intensive) procedures, and who are still productive at their established level of productivity. And for those that do not fall in this category, the state could offer hospice care.

Here we only provide a preliminary sketch of possible contingencies. One thing is certain. The trend to extended life with extended life care is advancing toward a socio-economic national interest contingency that has still not be brought into focus. Yet that future is coming in the days after the day after tomorrow.

A Safe and Clean Method of Destroying Spent Nuclear Fuel

Ryan J. Russell

Throughout history, scientific and technological discoveries have clearly improved the human existence. Today we live longer, healthier, and (arguably) more productive lives than our ancestors could ever imagine. However, many of these discoveries have been accompanied by the onset of unintended externalities requiring ingenuity and massive social change for man to adapt to his altered environment. Witness the social upheaval (i.e. urbanization, creation of a middle class) that accompanied the industrial revolution. But time after time mankind has risen to meet the challenges posed by these unintended consequences – either by modifying the technology to fit into traditional social constructs or changing traditional social constructs to fit with the new technology. History’s most ground-breaking advancements often set in motion an

evolutionary series of refinements designed to improve the initial technology while minimizing its detrimental consequences.

The harnessing of energy to generate and distribute electricity is in the midst of this transformative process today. We have advanced safer, more effective means of power generation to the point where our economies and lives are dependent upon a reliable source of electricity. However, the United States' reliance upon fossil fuels as the primary source for generation presents significant risks for our economy (energy dependency), the environment, and increasingly more so on our national security. The development and advancement of commercial nuclear energy, a major step in the evolutionary process of power generation technology, has presented a viable alternative to fossil fuels and has served as a significant mitigating factor on our oil and natural gas dependencies. In fact, nuclear power constituted 20% of net generation in the United States in 2002¹⁷ (the most recent year for which data is available).

Nuclear energy has proven to be a cost-effective and carbon emission-free method of power generation. Unfortunately, the construction of new commercial nuclear reactors has been largely abandoned¹⁸ due, in large measure, to the lack of a safe and effective means of disposing of spent nuclear fuel rods. Work is ongoing at the planned Yucca Mountain repository outside of Las Vegas, Nevada, but after 10 years of development and costs conservatively estimated at close to \$9 billion, it remains a controversial solution to the spent fuel storage problem and its operability is far from certain. Dry spent fuel storage facilities have been erected on the sites of many nuclear reactors, but they are neither a practical nor affordable long term solution. Research within the industry and the U.S. government is ongoing, and the evolutionary process of technology will likely find a solution to the storage problem in the next 10-15 years, once again demonstrating mankind's resourcefulness in addressing the challenges presented by advanced technologies.

The discovery of a solution to the long term spent fuel storage problem would not only reinvigorate the nuclear power industry, sparking new construction and attracting more resources, it would also revolutionize the driving engine behind the U.S. and global economies – reliable and affordable energy. One can envision several methods of destruction, including a chemical process that safely breaks down the radioactive components of the spent fuel, the discovery of a safe means of exploding the waste, or the development of a reliable method of transport into space. The means of destruction is less important however than the consequences it will have on the world energy markets. The analysis below will focus on the economic impacts this future contingency of interest (FCI) would have, but it is clear that such an occurrence would also have severe consequences on the environment and on national and global security.

The deregulation of the electricity market in the late 1990s ushered in a period of consolidation among utilities that own and operate commercial nuclear reactors and sparked new interest among several of them to commence construction of new plants. Several have applied for, and received, initial licensing approval from the Nuclear Regulatory Commission (NRC). Westinghouse has made significant investments into the research and development of new, more efficient reactor models. They recently obtained approval from the NRC for their AP-1000

¹⁷ According to the U.S. Department of Energy, of the 3,858,452 thousand megawatt hours produced in the U.S. in 2002, 780,064 were from nuclear power plants. See <http://www.eia.doe.gov/cneaf/electricity/epa/epates.html>.

¹⁸ The only significant new activity since the early 1980s is the current work to recover TVA's Browns Ferry Unit 1, shut down in 1985 for operational problems.

design - a smaller, safer, 1000-MW nuclear reactor that could be constructed quickly and with minimal impact on the surrounding environment. In other words, there is a groundswell of momentum in the industry simply waiting for the type of breakthrough that a spent fuel storage solution would provide.

Immediately following discovery of a destruction method, work would begin on identifying interested utilities and viable locations for new generation facilities. Following groundbreaking, the first wave of new plants would likely take 4-5 years to construct, with the construction of future plants accelerated as they benefit from the trial and errors of the first wave. Electric utilities would be anxious to escape the high costs imposed by emissions standards and shift their generation capacities to nuclear energy, particularly as construction costs declined. As the new plants come on-line, older coal- and gas-fired plants would become obsolete and would be “mothballed.”

Because of the consolidation within the industry mentioned earlier, large economies of scale would be created in the construction process, and later in the actual generation of electricity. Nuclear energy is already a relatively inexpensive means of generating electricity, but when combined with these added efficiencies, generation costs would be further minimized. Consumers would be the biggest beneficiaries of these developments, as lower energy bills would significantly decrease the costs of doing business in the U.S. and the average household income would increase.

The nuclear industry would once again attract the best and brightest to participate in the industry’s revival, creating new job opportunities in the construction, operation, maintenance, management, and development of new plants. Tertiary industries would also benefit – there would be an increased demand for industry training (and perhaps retraining of those standing to lose their jobs in the fossil fuel-driven plants) at universities and construction companies would require significant manpower and equipment, just to name a few. By once again attracting many of the nation’s best scientists and an increased focus on its merits, the commercial nuclear industry would likely also experience accelerating technological improvements in the fields of operation and design - pushing generation (and subsequently) energy consumption costs even lower.

Furthermore, the U.S. would no longer be so heavily reliant upon the volatile oil and natural gas markets to power our economy. We have shaped many of our bilateral relations and foreign policy decisions to avoid interruption of our fossil fuel supplies, a myopic approach with often dangerous consequences. As the energy crisis of the 1970s, and the current record-high oil prices show, this dependency has a significant hold on our economic well being. A resurgence of the commercial nuclear industry would provide a means to minimize the influence that global energy markets hold on our prosperity. Unpopular policies at home and abroad vis-à-vis the Middle East would no longer be necessary to ensure that our economy is not held hostage by hostile regimes. Enriched uranium, the primary component in modern nuclear fuel designs, can be found in large supply throughout the world (currently 16 countries have identified significant natural supplies), its costs are relatively low, and much smaller quantities are required for the effective operation of nuclear plants.

The technologies discovered here would be in high demand throughout the world - increasing both U.S. coffers and prestige. The export of our ideas and technologies would be desired by both the developed and the developing world because electricity is the foundation for economic development. Wise energy policies with respect to proliferation of these new technologies would allow goods, services, and ideas to be more easily exchanged and would

likely lead to a global economic boom. The development gap between North and South could easily be eliminated through wise and visionary stewardship of nuclear power generation (or, conversely, the gap could be exacerbated by policies designed to deny access to its benefits). Production capabilities, standards of living, global health, and the environment would all experience dramatic improvements if generation costs can be sufficiently decreased to the point where lesser-developed countries (such as those in Africa and South Asia) could also benefit from commercial nuclear energy. Because the dangerous byproducts of nuclear generation could be destroyed, we would be less apprehensive of sharing this equipment and knowledge.

Much effort and treasure has been devoted in the United States to searching for alternative fuel sources because our leaders recognize that the ability to generate and distribute electricity efficiently is increasingly important for the prosperity of our national economy. However, the fact that an alternate energy source has already been developed is often overlooked. Nuclear generation has been a safe and productive component of our national energy strategy for more than 4 decades, yet our policymakers fail to realize its full potential. Growth of the commercial nuclear industry has been paralyzed by the lack of an effective means to dispose of the dangerous byproducts of the generation process. If a solution to this dilemma can be found, our country and the world stand to benefit from an economic windfall, not to mention the benefits of an improved environment (nuclear energy does not emit the gases, such as nitrous oxide, that are believed to lead to global warming). Mankind has demonstrated its ability to overcome negative externalities in the past, and our ability to lead the evolution of nuclear technology to eliminate the dangerous spent nuclear waste in the near future is something that should be carefully considered - its potential impact is simply too large to be ignored.

Appendix II: Governance FCIs

Will Russia Survive?

Kambiz Fattahi

Introduction

The future of Russia depends on a wide range of interconnected economic, political, and social factors. However, the country's demographic change may prove to be a crucial factor during the next decades. Russia's population is declining rapidly. Although the Russian government is likely struggle to reverse the decline, Russia's regional and distant rivals such as European Union and China may strategically exploit this weakness.

My scenarios presuppose the following conditions in the next 50 years:

1. Russia's economy is stagnant and its political structure is in turmoil
2. The European Union, successfully consolidated, has expanded to the Russian frontier.
3. NATO has survived and has a good relationship with Russia.
4. China is still a major power and enjoys a high rate of economic growth.
5. The United States, the world's only super-power, cooperates with Europe.

Demographic Challenge

In his first annual presidential speech in July 2000, President Putin listed the Russia's 16 most acute problems; the declining size of Russia's population was number one on the list. He warned

Russians, “*the very survival of the nation will be endangered.*” The threat is real: at current growth rate of (-0.45%), the Russian population is estimated to shrink by 750,000 each year. If this continues, Russia’s population will shrink by one-third by 2050, falling from around 144 million today to about 100 million. This estimate does not include people who die of AIDS. Russia is aging rapidly, as well. In the long run, such a pervasive degradation of population is a serious blow to sustainable development of the country, undermining Russia’s international status, as well as altering global geopolitical equations.

A Pessimistic Scenario: Sino-Russian Military Confrontation

China may effectively exploit Russia’s demographic vulnerability. The Far East Russia, a region enriched by enormous natural resources, is particularly vulnerable to Chinese intrusion. Currently, part of Russia’s political elite, as well as a significant part of the population considers migration of Chinese to Far East Russia a distant threat. While the nine regions of the Far East have an aging and shrinking population of roughly 7 million, just across the border, the three Chinese provinces are home to 300 million. If the Chinese migration to Far East Russia continues at the current tempo, Russia’s Chinese population could reach 10 million by 2050, making the Chinese the largest ethnic group in Russia after Russians. As a result, by 2050 only around 2,700,000 ethnic Russians will be left scattered in the vast Far East region.

Russian reaction to Chinese migrants in the Russian Far East could lead to tense relations, with the possibility of military confrontation. This increases instability in Asia. The first scenario envisions the following situations:

1. Chinese immigrants outnumber Russians in the Far East region.
2. The “hard working” Chinese labor effectively replaces the shrunk and aged Russian workforce.
3. Chinese businesses become the region’s economic engine, exploiting its vast natural resources.
4. The Chinese’s government visibly intervenes in Russia’s domestic affairs to protect China’s geo-economic interests and the Chinese population.
5. The Chinese army exploits the weakness of Russian army and boosts its presence along Russia’s border.

These situations generate an extreme reaction in Russia. Nationalist elites raise serious concerns about the “Chinese Takeover.” Sanctioned by the army and the police, organized mobs attack Chinese businesses and residents. Duma passes a law ordering mass expulsion of Chinese residents from Russia. Chinese businesses are declared nationalized and confiscated. Russian troops clash with Chinese army along the border. A large-scale military confrontation can be next. Taking advantage of the weakness of Russia’s conventional forces due to population decline, Chinese army may move in to occupy the Far East Russian terrain. This may drive Russian military to resolve to its unconventional capabilities, including nuclear weapons...

An Optimistic Scenario: Russia Joins European Union

However, a more optimistic scenario is feasible: Russia joins European Union. The progressive expansion of prosperous European Union toward Russian frontiers, the considerable influence of the United States over FSU Republics in Central Asia, Russia's failure to retain control over the flow of energy in the Caspian region, the continuing economic stagnation and political instability in the country, Russia's demographic as well as geo-strategic imbalances with China, and finally the inability of the central government to develop Russia's most precious asset, *Siberia*, are more likely to convince the Russian leadership to join the EU as a last resort.

With Russia, the EU may surpass the United States and become the world's Super Power. *Siberia* alone can provide both Russia and Europe with enormous natural resources needed to significantly enhance their economies. Europe seems to be Russia's only reliable partner in this endeavor: it has the capital and technological capabilities to develop Siberia to help the Russian government to curb Russia's mounting demographic, economic, and social problems. The Russian leadership also comes to realize that the deal is fair because Russia needs Europe's support, given Russia's declining population and ever-increasing threat of China in the region.

As a result Russia transforms itself to a prosperous, medium-size power within the EU. Russia undertakes a series of social, economic, and political reforms. Thus, power significantly shifts from Moscow to Brussels. As a result, the balance of power in the world dramatically changes in favor of Europe Union. The "New Europe" emerges as the world's new super power. European "*Scramble for Siberia*" will take off to exploit Siberia's untapped natural resources.

Nuclear Terrorist Attacks: Implications for Governance

Shai Korman

Introduction

The subject of a surprise nuclear attack engineered by non-state actors has been tackled in novels, movies and most recently, the 2004 presidential debates. Particularly, since the fall of the Soviet Union and the proliferation of nuclear technologies to perceived rogue states such as, Iran and North Korea, the likelihood of a nuclear weapon landing in terrorist hands within 10 – 15 years is becoming extremely likely. Furthermore, through technological advances, the availability of smaller more mobile atomic bombs is inevitable. While this future contingency of interest (FCI) is often tackled from security, environmental or technological perspectives, a surprise nuclear attack must also be considered for its potential impact on governance. Unlike some FCIs, which will develop through the evolution of creeping trends, this event will arrive suddenly, altering the face of governance throughout the world within a few years.

This analysis will assess the impact of a scenario where there are two simultaneous small nuclear weapon attacks in Boston and London. Specifically, this essay will examine the impact across three dimensions: 1) U.S. government structure; 2) U.S. government-civilian relations; 3) transnational governance. Findings indicate that a nuclear attack on Western powers' soil would shake the foundations of governance as we know it both domestically and internationally.

Structure and Scope of Analysis

This analysis will present a brief scenario, describing the event as it may occur in within the next 10 to 20 years. It should be noted that the scenario is not meant to reflect a definitive prediction about future events. In this case, the scenario is a likely picture that is being used as a venue for discussing the impact of a broader FCI. The emphasis of the discussion is on aftereffects as they pertain to governance, as opposed to offering complex scientific or military accounts and projections of the potential attacks. In a similar vein, though economic, security and environmental themes will be underlying throughout the analysis, this essay will focus mainly on potential changes in government institutions and their relations with citizens. Additionally, though there will surely be a myriad of dramatic changes in governance throughout the world, the discussion is limited to the aforementioned key dimensions in order to lend effective analysis in limited space.

Scenario

On July 4, 2025, nightmares born at the beginning of the nuclear age and emboldened in the wake of 9/11 came to fruition. At 3:12PM (U.S. East coast time), a small mobile nuclear bomb was exploded in downtown Boston, shattering American life as it was once known. A truck that entered the United States through the Canadian border north of Vermont exploded on Commonwealth avenue only blocks from Fenway Park and Kenmore Square. The infrastructure of the city was devastated and thousands of lives were lost. At 3:37PM (U.S. East coast time), in London, a delivery truck arriving at a shopping center in Piccadilly Circus exploded a similar bomb laying many buildings, commercial centers and lives to waste.

A radical terrorist group, known in the intelligence community as “Al Qaida 3,” claimed responsibility for the attack. The group is loosely affiliated with the original organization which was led by Osama bin Laden, but has taken a far more radical turn. The group justified the attacks as revenge for the invasions of Iraq and Afghanistan in the early 2000s. After a full year of investigations, it is clear that the materials were bought from ex-military leaders in former Soviet states who had access to nuclear facilities. Though economic and environmental damage occurred, those avenues were not as dramatically changed as the way governance was changed throughout the world. Societies have become increasingly closed, as leaders have turned to more authoritarian methods of governing. There has also been an increase in international governance cooperation among the Western allies, while powers such as Russia and China have elected to work alone in using their own methods to reassert domestic control.

U.S. Government Structure

In the wake of the attacks, governmental structure in the West has taken a decidedly militarized and authoritarian turn. In order to highlight the changes, the case of the United States will be used, though similar transformations have taken place in the United Kingdom, Canada and the European Union. Similarly to the after effects of 9/11, the President of the United States pushed for more unchecked power, funding and resources for the Department of Justice, Department of Homeland Security and National Counterterrorism Center.¹⁹ With the passing of the PATRIOT Act 4 into law, these departments were given unprecedented authority to covertly detain and

¹⁹ Established by the Congress and signed into law by the president in May 2006 as per recommendations by the 9/11 Commission.

abduct individuals suspected of links to any anti-government activity. Whereas previous Acts limited jurisdiction to people linked to terrorist networks and activities, the domestic security apparatus is now free to hold nearly any targeted individual inside the U.S.

Additionally, the act legalizes both psychological and physical torture of prisoners as a means for obtaining information. As described in PATRIOT 4, torture of prisoners is permitted provided law enforcement agents obtain a court order from a federal judge once proving that the detainee is connected to an imminent terrorist threat.

The National Guard and Army reserves were called up and placed on permanent patrol in every state, subordinating local and state police to regional military commanders entitled, Governor Generals. The 18 Governor Generals appointed by the president are charged with coordinating law enforcement in each of the states designated to given regions. The Governor Generals have also attained a degree of unofficial power, heavily influencing state and municipal apparatuses, as well as political leaders.

In addition to new powers, the government has put substantial emphasis on enhancing virtual governance. This has been done largely to preempt attacks and allow the government to function more effectively in the event of emergency. For example, an extensive close circuit television (CCTV) network – similar to that which the United Kingdom implemented by the early 2000s – has been installed in every major city in order to monitor sensitive areas and deter actors who do not wish to be identified. Another example of virtual governance has been the increasing use of advanced robotics, unmanned drones and vehicles in implementing government projects. These vehicles, which were developed by private companies contracted to repair and restore areas in Boston affected by the nuclear attack, are now being used in government projects ranging from damn construction to disaster rescue.

U.S. Government-Civilian Relations

Government-civilian relations have taken a multifaceted turn in the aftermath of the nuclear attacks. On one hand, there has been a substantial degree of civilian quiescence towards expanded government, military and virtual control of daily life. On the other hand, a subtle but widespread mistrust has developed between citizens and the government, as well as between citizens themselves. Polls and elections have reflected strong support for candidates and policies consistent with new more authoritarian style of government. Politicians advocating the repeal of PATRIOT 4 and CCTV have fallen by the wayside of mainstream politics. However, in contrast, citizens have become extremely guarded when dealing with government officials. Public demonstrations and criticism against the government have been dampened due to fear of incarceration and investigation.

One of the most pervasive new trends in society is that citizens are frequently reporting neighbors, co-workers and friends to the government and law enforcement officials. While this has led to the arrests of key terrorist actors and associates, this trend has also led to an extraordinary sense of mistrust in local communities. City streets are often empty and conversation between citizens has been reduced to minimum necessary interactions. Society is becoming visibly more closed than ever before.

Transnational Governance

Similar to the changes made with respect to domestic governance, there has been significant international cooperation among the Western allies to maintain tighter control of civilian travel activities. Particularly, the United States, the United Kingdom, Canada and the European Union have become a nucleus of nations redefining transnational travel. In a series of multilateral agreements, these countries have agreed to a unified standard of forgery detection and freedoms for customs officers to detain and interrogate foreigner citizens not belonging to this core group of nations.

Beyond traditional means of border monitoring, new initiatives have also been implemented in an effort to monitor and investigate foreign visitors to the U.S. Most notably, the international introduction of the Geiger Counter Program and GPS tracking devices has altered the landscape of cross-border travel. With specific respect to the threat of nuclear weapons, the Geiger Counter Program has led to the installation of Geiger counters at every border crossing, port and airport terminal in the U.S., as well as in other participating nations. This method has already yielded the capture of numerous individuals attempting to transport nuclear materials across participating nations' borders.

With the implementation of the GPS Tracking Initiative (GPSTI), the government mandated that all foreign citizens from a specific list of countries entering the United States be required to wear wrist bands containing global positioning satellite tracking beacons at all times. Additionally, the security services are required to execute random sweeps and pick-ups of visitors and immigrants using the GPS devices. The wrist bands are made in such a way that an alarm is triggered if they are removed. As a result, the visitor is arrested upon trying to leave the country or when apprehended. Entrance taxes have been enacted in order to pay for the distribution of the GPS devices. In order to ensure the widespread success of GPSTI, the U.S. has partnered with the United Kingdom, Canada and the European Union setting an international standard for this policy. While plans exist to extend both new programs to countries such as, Russia and China, there have been diplomatic difficulties coming to agreements about the principals of implementation.

Countries outside the nucleus of Western nations have taken cues from the West's restriction of civil liberties in the name of security. The West's move to more authoritarian control has had a ripple effect throughout out the world, as many governments with more dubious commitments to democracy have justified taking full-blown authoritarian control of their countries and resources in the name of fighting terrorism. For example, in the same vein as former Russian Premier Vladimir Putin's attempt to centralize control of Russia's provinces after the Beslan massacre, the current Russian leader has ordered martial law throughout the provinces in the name of thwarting terrorism. Similarly, the Chinese government has repealed many civil reforms claiming that it must implement China-specific solutions to the new challenges presented by nuclear terrorist attacks. While this array of new policies may lead to better security, the West, by its own example, has encouraged less democratic countries to reverse previous moves towards reform.

Conclusion

As illustrated through this scenario and analysis, a nuclear attack by a non-state terrorist actor would heavily impact governance across dimensions such as, government structure, government-civillian relations and transnational governance. A turn to more centralized draconian methods of control in the West will encourage even harsher tactics among other powers. Most significantly, though this discussion directly tackled issues of governance, the potential changes highlight the complex interaction of different fields such as science and security. The complex impact of this topic highlights its importance as a future contingency of interest. The sudden impact of nuclear terrorist attacks in the West must be studied further in order assess its full range of implications.

The Global Grid

Juliette Schmidt

Summary – In 2015 – 2025, widespread adoption of *grid computing technology** results in a functional global grid that has accelerated the Information Revolution. Individuals, organization and groups are linked in ways they have never been before. Data can be crunched and simulated faster, easier and more comprehensively. This puts power that previously belonged only to government, big business or well-funded scientific projects into the hands of individuals. Governments are faced with a significant black market in identity, as well as a barrage of new, complicated intellectual property cases and faster rates of innovation, complicating relations between countries and creating new domestic concerns.

2004 – 2015 – Technological Innovation in the Business & Scientific Communities

Since the 1940s, computer modeling has enabled humans to understand the past, present and possible future in new ways. The world is moving along in the information age using internet, email, electronic communities, protected websites, wireless phones, pdas and other technologies. The government worries about firewalls and hackers, and sometimes, along with the business & scientific communities, about getting more computing power to run bigger test simulations (for nuclear weapons testing, military scenarios and intelligence) faster and smarter.

Although the first pieces of grid computing technology exist, standards are still developing and few software and web applications are ready to run on the grid, even on small localized or enterprise-wide grids. In the press, future grid projections are widely criticized as being too much hype and not enough substance. The only places small scale grids are used is in businesses, scientific and government communities that are perpetually searching for more computing power to run complex drug development scenarios, crash test simulations and climate or weather predictions, are running small scale grids and who have adapted their applications to run on new grid software.

The average individual has either not heard of the technology or has dismissed information on the topic as too technical and futuristic for real consideration, especially since there is no real consumer use for grid computing at this time. Despite the mixed press and analyst reviews and

* Grid computing enables geographically dispersed computers or computing clusters to dynamically and virtually share applications, data, and computational resources, all connected through a global grid computing infrastructure.

the disinterest of individual consumers, business and government adoption of small scale grid computing is providing grid suppliers with the income to continue innovation and development of this new technology. Since most grid installations are domestic and commercial, there is little pressure for governments to consider this technology as a new policy issue.

2015 – 2025 – *Fueling the Information Revolution*

Just as the power grid added fuel to the industrial revolution years after the “revolution” began, and the real printing revolution didn't happen until an literacy substantially improved, costs were reduced, and printed materials became more portable, hundreds of years after the printing press was invented, the information revolution required the widespread adoption of grid computing infrastructure to really take off. Just like literacy and power, some parts of the world have been better able to take advantage of this new innovation, however each country is able to *plug in*^{*} to the grid to some extent.

Although the evolution of grid has been gradual, widespread adoption has been quite sudden. Like email, modems, the Internet, and even DVD players, there is a significant period of time in the life of any new technology while it is being developed, and a second phase where early-adopters and beta users test it and point out necessary improvements. Finally, when test groups have given the thumbs up and the infrastructure to support the new technology on a large scale has been implemented, then there appears a sudden rush, often over 2-3 years, when the public at large gets on board. Or, in the case of grid, plugs in. As a result, governments were unprepared for some of the implications of this new wave of information technology.

The vision for the grid, and different pieces of the technology that enables it, have existed for over 3 decades, however it is only in the last few years that a global grid in any real sense of the term has existed. Business applications have been adapting to the grid for years, and applications that were previously designed for personal computing, such as word processing software, have now also been modified to run on the global grid. Software simulations that previously required a room full of supercomputers and a designated scientist familiar with complex algorithms and processes are now user-friendly and accessible to the common person. For example, students and interested citizens can now simulate slow-moving epidemics and watch them spread and multiply across maps, getting a sense of the implications in a way that far surpasses looking at algorithms that many wouldn't fully understand. The layperson can work out dynamic simulations him/herself, putting knowledge, and the power that accompanies it, in the hands of individuals.

In addition to empowering individuals, in a grid-enabled world there is much more international collaboration, matching specialized computing equipment in one part of the world, with an expert in another part. This allows previously incompatible applications to work together as part of larger processes to map the global health, and has already resulted in finding the cure for a few major diseases. However, one unexpected problem has been how to patent new inventions and drugs when the individuals and resources responsible span multiple countries. Another

^{*} The term “plugging in” has remained despite the fact that virtually all computing hardware is wireless in 2015 – 1025.

difficulty has been governments' inability to deal with a multitude of new innovations coming in at once. Certification institutions are backlogged, creating additional institutional bottlenecks.

Another characteristic of the grid, is that virtually every piece of existing technology – cell phones, pdas, *portable computers*[®], *public advertising screens*[‡] – is now plugged in to the grid. As a result, individuals can “opt-in” to such features as customized advertising campaigns, where billboard they are walking past shift to reflect their tastes, or tracking programs that allow friends and family to find their whereabouts on mapping systems.

However some individuals worry about what this does to their personal freedom. Governments are now able to “track” visitors to their countries, and many people worry that all their preferences, communications and movements are tracked. Unlike a decade or two ago when it was not possible for the government to process all this information and it was likely that even if an individual did visit a monitored website on one day or make a suspicious cell phone call on another it might have gone unnoticed, grid computing has enabled governments to run massive matching tests almost in real-time. It is not clear whether governments are making use of this capability, however, as with most new technologies, there is a significant proportion of the population that is skeptical of how “Big Brother” might be using it. As a result, a black market in identities -where individuals can buy, sell and trade identities – has taken identity fraud to a whole new level.

Governance Implications

There are myriad possibilities for a grid-enabled future, however based on this scenario, some implications for governance may include:

- 1) After the grid explosion, individuals are now able to access huge amounts of compute power that was previously only the domain governments, well-funded organizations or profitable businesses. Just as giving people more access to information through the Internet enabled them to make more informed decisions on domestic issues and gain exposure to international issues, putting additional information processing capabilities at their disposal increases their ability to understand current affairs and even forecast future scenarios. A global population with this information at their fingertips increases the demands on governments.
- 2) Skepticism or uncertainty over whether citizens are being monitored by the government or not may have domestic implications, especially in the United States where individuals place high value on individual freedoms.
- 3) It becomes easier to track foreign visitors, which would be a great coup for homeland security officers, but government may face the temptation to make agreements with friendly countries not to track their citizens, especially when government or intelligence officials from their own country are being tracked abroad.

[®] Computing interfaces (previously screens, keyboards, etc) have continued to become smaller and more organic (for example, speech recognition technology has improved and taken off, for the most part, replacing the keyboard) and “wearable” designs have been created so that people are rarely unplugged from the grid.

[‡] Formerly billboards.

- 4) Identity fraud may increase tenfold. A black market in identity would soon mitigate any advances in tracking technology, create financial risks, abuses of social services, introduce new categories of “high-risk” travelers from countries with high rates of identity-trade.
- 5) Faster innovation and complicated intellectual property rights cases may get caught up in government processes that are unprepared for such a rapid increase, putting additional pressure on governmental institutions.

A Standing Army for the EU: Implications for U.S. Global Leadership

Marina Kielpinski Shishniashvili

Summary: In 15-20 years, the EU has established a standing army with the capacity to carry out humanitarian interventions, peacekeeping, and constabulary missions. This effects global governance as the EU becomes the force the world looks to for leadership during humanitarian disasters, genocide, and other international crises. Although it still wields a much more powerful military than the EU, the U.S. is increasingly isolated. Now the U.S. must decide whether to try to change this trend through more involvement in Europe, and if it should engage with or challenge the growing power of the EU.

15-20 years from today: The global political landscape has changed enormously since the end of the Cold War, and it continues to evolve as we move deeper into the twenty-first century. The nation-state remains the dominant structure in global politics, but the role of non-state actors is at an all-time high. Multilateral organizations are not static institutions but changing bodies that serve a specific purpose. The UN continues to play an important role in world affairs and has been reformed somewhat; trade is at the center of interstate relations, and regulatory bodies like the WTO are flourishing.

The EU has grown and expanded since 2004, and wields a great deal of power politically and economically. It has already proven to be a more effective multilateral actor than the U.S. in humanitarian crises and failing states, coordinating with NATO and the UN to intervene in crises since 2003. It has been clear to the international community for years that a standing force for constabulary and peacekeeping missions is needed, but the U.S. has not been able to fill that need. The EU, with its growing membership and activity in global politics, chose to refocus funds spent on NATO and individual defense to create a standing EU force to meet that need. The result is a re-shifting of power balances; the formation of a standing army constitutes the tipping point that makes the EU a full-fledged rival of U.S. global hegemony. This has implications for global governance and the reduced role of the U.S. on the world stage.

The EU dominates economically, pushing through trade regulations that suit its interests. The EU now encompasses a much larger population and GDP than the U.S. The possibility of a military confrontation between Europe and the U.S. remains highly unlikely, but that does not mean the relationship is harmonious. There are serious disputes over spheres of influence and economic and trade issues. The establishment of an EU military adds another element to this potentially dangerous mix.

Military and security alliances: NATO still exists, but its role has been reduced. The pressing security needs in Europe are crisis management and stabilization on the southern borders, which are not part of NATO's mission. The failure of states is a major concern as former Soviet republics go through phases of authoritarianism combined with terrorism (as in Uzbekistan and Turkmenistan) and African countries deal with crime, disease, and corruption. Member states are no longer willing to pay for NATO – which is neither equipped nor willing to engage in these types of operations – and are more heavily invested in the EU military force. As this happens, the U.S. is increasingly marginalized. It still plays an important role but is no longer viewed as the dominant force in international security. It must decide whether NATO should be kept intact, or whether its mission and membership should be changed; at present, NATO is being used as a tool by the EU to strengthen intervention and policing missions, on the model of Operation Concordia (a successful EU-NATO mission in FYROM in 2003). In addition, the U.S. now has to contemplate how to engage the EU as a partner, as its growing power begins to be seen as a threat to U.S. national security.

Not all states are eagerly embracing the EU's leadership. Russia, for example, is still not a member and is unlikely to become one soon; it has become an authoritarian state that behaves unpredictably, and neither the U.S. nor the EU has secured a strong working relationship with Moscow. The U.S. must consider whether it should make an alliance with Russia a priority to counterbalance the spread of EU dominance across Eurasia.

The U.S. still holds its seat on the UN Security Council, as do Britain and France. The UN and the EU have been working since the turn of the century to integrate their defense capabilities to facilitate quicker responses to crises, and it has worked. Now the two organizations are in constant cooperation and have completed several successful interventions where the UN authorized use of force and the EU supplied the force. Again, the result is less U.S. involvement in joint international security and defense activities.

Global leadership: It has become clear that traditional military interventions, seen throughout the 1990s and in Iraq, are not sufficient to ensure lasting security, and it was widely agreed that some type of constabulary force was needed to provide for security during reconstruction efforts. The U.S. is not aiming to decrease its involvement in global governance; rather, its efficacy is lowered by its own institutional constraints (i.e., the Congress will not support creation of constabulary forces). The EU was working toward an international constabulary force as early as the 1990s, having provided policing forces in the Balkans and then later in Africa in cooperation with the UN.

The international community turns increasingly to the multi-pronged approach offered by the EU and its partner institutions such as the OSCE and the Council of Europe. This approach includes economic and civil governance assistance, and now the capacity for military intervention with constabulary forces – a much more comprehensive package than that offered by the United States. In addition, proponents of a rule-based international order have been surprisingly successful: Leaders who have perpetrated crimes are now prosecuted at the International Criminal Court, another EU-led institution that the U.S. is not a part of.

There are also geographic realities to consider: many of the states affected are much closer to Europe's "backyard" than that of the U.S. This trend is likely to continue; the organization has outgrown the traditional geographical bounds of Europe, taking in Turkey and now weighing applications from Georgia, Armenia, and Morocco. The EU has been more successful than the U.S. at forging productive working relationships with regional giants such as Brazil, China, and India than the U.S. has been. It will be essential for the U.S. to build strong relationships with regional leaders, economically, military, and otherwise, if it wants to prevent an EU-led world.

Conclusion: The U.S. has failed to meet a growing international security need – a rapid-reaction force capable of handling peacekeeping, humanitarian interventions, and constabulary missions – and the EU has restructured its security and defense plans to meet that need. The EU also has continued to grow in membership, economic power, and involvement in global leadership. These elements combined are marginalizing the U.S. as NATO becomes a side note and the European economy continues to grow. This shift in power balances will force the U.S. to decide whether to become more engaged in European institutions or to challenge the EU as a new leader in world affairs.

Appendix III: Science & Technology FCIs

Evan Michelson and Mark Avnet

Discovery of extraterrestrial life, past or present

The discovery of life elsewhere in the solar system or even the universe is likely to cause a fundamental shift in the way that humans perceive their place in the universe. The nature of the effect on society will be largely dependent on the particular discovery made:

- **Evidence that microbes once thrived on the surface of Mars.** The search for life is a key element of current Mars exploration goals around the world. Currently, the emergence of evidence that water once existed on the planet's surface can be seen as a gradual development. However, a discovery of water existing today on the surface of Mars is likely to constitute a step change. Furthermore, a discovery of life, or even fossils of microscopic organisms, would be a tipping point.
- **Discovery of living organisms in the subsurface oceans of Europa, one of the moons of Jupiter.** Some time during the next decade, the United States plans to send an aquatic probe to drill through the icy surface of Europa and determine if a water ocean exists below. If microbes are found, this will be a tipping point, much like a similar discovery on Mars.
- **Detection of an Earth-like planet orbiting another star.** In the last decade, scientists have confirmed the existence planets in other solar systems. Current telescopes are not capable of resolving planets that are the size of Earth (if they exist) because of the brightness of the stars that they orbit. If the Terrestrial Planet Finder (TPF) telescope detects a planet the size of Earth with a significant amount of water and a similar atmospheric composition to the Earth, this might be a step change. However, it could even turn out to be a tipping point depending on the perception of the likelihood that advanced life exists on the planet.

- **Radio signal received that is believed to have originated from a distant advanced civilization attempting to communicate with us.** In the 1970s, radio astronomers received one signal whose origin could not be explained while conducting activities in the Search for Extraterrestrial Intelligence (SETI). If this, or a new signal, is verified to have originated from an intelligent species attempting to communicate with us, it will cause a tipping point because it will mean that we are, in fact, not the only intelligent life in the universe.

Confirmation of a Grand Unified Theory (GUT) in physics

The most significant problem of modern physics is the contradiction between two of its fundamental theories – quantum mechanics and general relativity. String theory is one possible candidate for a Grand Unified Theory. It seems to be self-consistent, but its correctness in actually describing the natural world has not been confirmed. If this or another theory unifies physical thought, it will shift our understanding of the universe. In this way, it could be seen as a step change or tipping point in how we conceive of the history of the universe, but it is actually the result a gradual work conducted over time by many physicists.

Computing power continues to rise exponentially

Developments in computer processing speed and storage continue to rise at an exponential rate. The ability of computers to learn, to adapt, and to think will become possible or even commonplace. Some potential future contingencies of interest include:

- **Computers overtake human intelligence and essentially become a distinct form of life.** Computers are becoming more and more powerful. Ray Kurzweil states that they are evolving at an accelerated rate compared to biological evolution.²⁰ If computers reach a level at which they can be considered to be alive, this could have profound effects on the way that we use them and the way that we view the uniqueness of our own species. In short, the ability to create a form of life could cause humans to reevaluate our place in the universe. Such a change would no longer be exponential, but, as Kurzweil notes, it could hit a tipping point and lead to a “singularity,” beyond which the future would be so divorced from past experiences that new paradigms and fundamental concepts would be needed.
- **Household chores become fully automated.** As robotics and computers advance, the idea of having a home that cleans itself is becoming increasingly plausible. If this happens, it will change the work ethic of anyone with the means to acquire this luxury, and it could cause a widened separation between the rich and the poor. On the other hand, it would also increase leisure time and allow people to pursue more intellectual and community-oriented pursuits. While this change is likely to be gradual in some aspects, wealthy individuals may seize this opportunity immediately and adopt the technology at a faster pace.

²⁰ Kurzweil, Ray. *The Age of Spiritual Machines: When Computers Exceed Human Intelligence*. New York: Penguin, 2000.

- **A full-scale quantum computer is developed.** Quantum computers are based on the principles of quantum mechanics. Instead of each bit having a possibly value of 0 or 1, each qubit exists as a superposition of the 0 and 1 states. This allows for ultra-fast determination of solutions to classically “hard” problems. This will revolutionize computing in many ways. However, the most significant known effect is that it will render network security obsolete because the security standard, RSA, is based on one of the “hard” problems mentioned above. This will cause the Internet to lose much of its value, and personal privacy will be destroyed. Furthermore, if terrorists obtain a quantum computer, they could quickly incapacitate the United States and every other developed country. On the other hand, the increased computing power could result in an economic upturn and could vastly improve quality of life. In any case, it has the potential to accelerate the outpacing of computer intelligence over human intelligence. Quantum computers capable of performing small (two- or four-bit) computations have been developed already. This development has been gradual but is likely to become exponential. Once a sufficiently large quantum computer exists, it could represent a tipping point.

Discovery of a large asteroid on a collision course with Earth

The threat of an asteroid large enough to cause significant loss of life or even to end most life on Earth has been taken more seriously in recent years. Although it would be futile to prepare for the catastrophic results of a sudden impact from a sufficiently large asteroid, it is more likely that we will discover one that will collide within a matter of years or decades. If this is found, scientific and technological development across the globe likely will be shifted toward finding ways of altering the asteroid’s orbit to avoid the collision. This would have a dramatic impact on the daily lives of nearly everyone on the planet. For this reason, such a discovery would constitute a step change. Once the panic settles, it is likely that the attempt to remove the threat would simply become another part of life.

Space exploration and utilization leads to the successful mining of resources from near-Earth objects (NEOs)

The world’s outlook on space exploration would shift fundamentally if it became feasible to obtain most resources necessary for space exploration in space. The prohibitive cost of launching large amounts of material from the surface of the Earth would lose relevance, and access to the solar system would be opened. This will be a slow, gradual change for quite a while but will eventually move exponentially. Once extraterrestrial resource mining becomes a regular practice, it will constitute a step change.

A room-temperature superconductor is discovered

Superconductors have a wide range of applications ranging from transportation to medicine to power generation. Although many of these uses are already known, materials with this property (even so-called high-temperature superconductors) generally become superconducting only at extremely low temperatures. Therefore, the discovery of a material that becomes superconducting at room temperature would revolutionize society in many ways. This will be a gradual or exponential change that will lead to a step change once room-temperature superconductors become commercially available.

Nanotechnology becomes the “industrial revolution” of the 21st Century

The ability to design, engineer, and arrange atoms at the nanometer level will become the dominant form of production. The applications for exceedingly strong and lightweight material, such as carbon nanotubes (CNTs), are numerous. They include ultra-lightweight aircraft, improved construction of buildings and bridges, and perhaps even a space elevator. These nanoparticles could be designed “to order”, and their presence will be commonplace in the body and in the environment. Research and development in nanotechnology already has begun, but its true impact will arrive suddenly, after an exponential increase in manufacturing innovation. Potential transformative events include:

- **Emergence of new interdisciplinary fields of research.** Nanotechnology will lead to the merging of traditional scientific disciplines. In place of pure biology, chemistry, and physics, new fields of study, including bio-nanotechnology, info-nanotechnology, and eco-nanotechnology, will become standard. This change has already begun in many fields, but nanotechnology will accelerate the trend further. Changes in education will be needed to cope with these new ways of thinking.
- **Carbon nanotube composite strength reaches the level needed for a space elevator.** Carbon nanotube composite development has been accelerating in since the discovery of CNTs in 1991. Still, it will likely be many years before CNTs are ready to be used for a space elevator. Once the space elevator is eventually built, though, it will shift ideas about access to space. Space exploration and development will become more economical and efficient. This will be a gradual or exponential development followed by a tipping point once the space elevator is available
- **Bio-compatible nanoparticles used for medical diagnosis and treatment.** Drug delivery systems will be developed that allow for real-time transmission of data regarding homeostasis and disease progression. Nanoparticles will be used to deliver drugs to specific sites in the body, monitor for onset of conditions such as stroke or epileptic seizure, and perform routine surgery and body maintenance.
- **Environmentally friendly nanoparticles used to clean up pollution.** Highly reactive nanoparticles will be designed to break down pollutants, such as carbon dioxide, into their composite materials. Industrial waste sites are easily managed, and nano-recycling moves the world towards a more sustainable environment. The developing world is able to use these particles as a cheap method to reduce emissions and, in turn, to improve public health.
- **Untested nanoparticles released into the environment, with long-term effects unknown.** Nanoparticles are released into the environment by accident or on purpose. Due to incomplete testing for safety, the long-term health and environmental effects are unknown. Panic leads to uncertainty about treatment or management. Entire ecosystems are isolated for fear of contamination.

Alternative energy sources, including wind, solar, and hydrogen power, become standard

The slow trend away from fossil fuels that cause excessive pollution will continue. Increased investments will be allocated to developing cheap, reliable alternative sources of energy. Eventually, a potential step change could occur as these technologies become widely available and affordable. Developments in this area could include:

- **Hydrogen- or electric-powered automobiles become the standard mode of transportation.** Cost and uncertain access to fossil fuels drives up demand for automobiles running on alternative energy technology. Fully electric automobiles become the norm, with new hydrogen-electric hybrids becoming popular. As hydrogen power becomes technologically feasible, it slowly comes to serve as the energy basis for transportation.
- **Solar and wind power are universally employed as a source of energy.** Both photo-voltaic cells and wind turbines are designed to efficiently and effectively store and transmit power around the globe. While these technologies will first be designed and implemented in developed countries, they hold the potential for revolutionizing access to energy in developing countries. In particular, these alternative sources of power will provide regular access to low-cost energy to rural areas around the world. The relative ease of implementing the infrastructure for these technologies will allow governments and companies to more easily tailor energy supply to specific geographical and societal needs.
- **Fusion**
 - **Deuterium fusion developed.** Attempting to mimic the energy of the stars, scientists find a way to successfully conduct fusion on Earth. Though a potential long shot, such an innovation would profoundly alter our ability to provide enough energy for the planet's needs. Basic scientific research would be needed before such a development could occur.
 - **Helium-3 (He-3) fusion developed, stimulating exploration of the Moon in order to provide Earth with energy from an off-Earth source.** If humans return to the Moon and if deuterium fusion becomes a reality on Earth, the possibility of mirroring those capabilities on the Moon will begin to seem real. Not only will this have profound effects for space exploration, but He-3 fusion may be the only source of extraterrestrial resources that would have a viable use on Earth. The generated power could be beamed to Earth by laser, and the level of power would be so great that this could become an economical means of producing energy. This will continue to be a gradual development as lunar missions and fusion capabilities are pursued. Once He-3 fusion does become a reality, though, it will cause a step change or tipping point.

Environmental degradation continues around the globe, leading up to the potential for a major catastrophe

Unless alternative energy sources are adopted earlier rather than later, environmental degradation will continue and perhaps accelerate due to continually accumulating pollutants in the atmosphere. Carbon dioxide emissions may remain unchanged or become worse, leading to a further increase in the greenhouse effect. Such run-away environmental destruction may reach an irreversible tipping point, and maintenance of more sustainable levels could become impossible. Potential developments include:

- **Average worldwide temperatures increase one to three degrees Celsius.** A rise in temperature of this magnitude would create havoc around the world. The polar ice caps would continue to melt, the lengths of summers would increase, and glaciers would continue to retreat. The environment may experience a series of cataclysmic shocks, including several hurricanes, rainfall, and extended periods of excessive heat. Local and regional climates would vary significantly. Northern latitudes would warm more dramatically, leading to the extinction of cold-weather species. Middle latitudes would be inundated with water, causing potential unending flooding in low-lying coastal areas, such as Louisiana, Bangladesh, and Vietnam.
- **Ocean and jet stream currents change course.** The melting of polar ice caps would release fresh water into the Earth's oceans, causing the salinity to vary drastically. A majority of the ocean's species would become extinct. Water and atmospheric currents would be altered, disrupting the flow of traditional weather patterns.
- **Deforestation destroys natural carbon cycle.** A lack of sufficient forest coverage, coupled by pollution, could severely short-circuit the carbon cycle to the point that oxygen becomes less available. New respiratory-aid technologies and insulated habitation models would be needed to address this problem. The growing patterns of plants and forest would be drastically altered.

Medical advances redefine human life

Potential positive and negative advances in health and medicine could reconfigure the human experience. From curing disease to cloning individuals, medical technology has the potential to completely transform the long-term future and could reach a tipping point, either by curing our ills or devising new ones. In particular, trends toward individualized and personalized medicine will continue to emerge – slowly at first, but more rapidly as the technology develops – as it begins to become practical to sequence individual genomes and to develop specific treatments on a person-to-person basis.

- **Regenerative body parts used in treatment.** Stem-cell research will lead to the copying of organs and body parts as needed. Advances in transplant surgeries will allow for natural replacements and enhancements to occur on a regular basis.
- **Cloning of human beings.** After replacement body parts become standard, the cloning of an individual's entire genome may become commonplace. Individuals could have genetically identical twins produced at will. Individual genomes could be stored,

reconstituted, and cloned at a later date. Genomes from individuals of the past will be resuscitated.

- **New strand of human species.** Research may lead to the discovery of the biological determinants of human beings. Changes in such structures may create a divergent species that is incompatible with *Homo sapiens sapiens*. A profound adjustment of our conception of humanity will occur. A new branch of the species would evolve and create possible competition for current human beings.
- **Development of a new strain of bacteria or virus that leads to biological weapons that can be released quickly on a global scale.** Although this is largely a security issue, it is dependent upon scientific development. This would mean that a single group of terrorists could pose a threat to the entire world at once. Viruses could be engineered to evolve rapidly, thereby increasing the difficulty of developing a successful treatment or vaccine.
- **Developed nations reject “Western” medicine on a large scale in favor of alternative therapies and holistic medicine.** Increasingly, medical professionals are closely examining the value of alternative therapies, some of which have existed for hundreds or thousands of years. A general theme of these therapies is a less reductionist approach that focuses on treating the patient as opposed to the disease. This has been and will continue to be a gradual development. However, it eventually could shift the conduct of medicine in the Western world.

Appendix IV: Security FCIs

Cyberstrikes: A Future Contingency of Interest

Evan Haas

Introduction

The internet is a multifaceted tool of such vast potential that its continued development poses multiple threats. The past ten years have seen the internet expand exponentially, increasing in speed and applicability, become incorporated into numerous aspects of everyday life, and most importantly reaching massive amounts of people with more becoming “wired” every year. It’s impossible to deny the extent to which the “online revolution” has changed the way the networked world works, but this is just the tip of the iceberg. The internet is growing and evolving quicker than governments can keep up and the new sector of business that has sprung up around the internet, and the techno-savvy people who run it, are blazing the way into this new wired world.

Why is the internet of interest now? What sort of threats could potentially arise from this vast, interconnected, global network in the future? What makes the internet unique is its generally positive functionality. Unlike conventional weapons, there are upsides to the internet and benefits it provides to society. The use of a missile is, while sometimes necessary, always an unfortunate course of action. With the internet however, its applications are endless and usually beneficial, such as paying a bill, doing pertinent research, or applying for a job. This double-edged sword makes responding to threats the internet provides equally as difficult as identifying

them. To make understanding the role of the internet as a future security concern, its potential threats and problems can be divided into two categories: soft threats, hard threats.

Soft Threats

Soft threats are those threats that do not necessarily have a direct impact or one that is physically manifested. These threats are likely to utilize the basic aspects of the internet for a range of reasons such as communication, propaganda, or possibly misinformation. Much like soft power is power derived from unconventional means of strength (economics, political prestige, etc.) soft threats are uses of the internet that can be devastating while going unnoticed.

Examples of soft threats:

- The dissemination of information to terrorist cells by means of messages imbedded in a .jpg image
- Feeding of false information to news sources regarding United States military actions in strikes against terrorists cells
- Streaming of funds from a mutual fund or bank account into rogue group coffers

Hard Threats

The opposite of soft threats, hard threats are those that cause noticeable damage. Not likely to be entirely cyber-based, hard threats more often than not are used in conjunction with a strike or some sort of attack. While more devastating, hard threats are easier to identify and easier to address, possessing a much higher risk versus reward element.

Examples of hard threats:

- The brining down of a power grid before a dirty bomb is detonated, jamming and hampering first response
- Hacking into and effectively disrupting air traffic controllers at an airport causing the crash of a plane

Response Problems

A separate but equally concerning problem regarding the internet is response. Response problems encompass everything that makes responding to the internet so difficult, which includes both the political and the practical. Because of the many uses of the internet, clamping down with legislation becomes difficult as freedoms and liberties of the general population become involved. Likewise, the internet is such a vast conglomeration of networks that policing it is hardly viable. The global nature of the internet also poses its own road blocks. It's impossible to react to a strike that originates on a laptop in Namibia when the response teams are on the ground in Chicago.

FCI: Hard Threats

Why?

Of the two veins of internet concerns, hard threats is the most pressing and the one that deserves the most attention in the coming years. Due to their high risk versus reward factor, it makes dealing with them more feasible than soft threats. This is not to say soft threats are of no concern, but their impact is much less severe, and addressing these issues becomes more difficult and politically tricky. The impact of an attack aided by the internet would be immediately devastating so attempting to protect sensitive network or critical servers

How and when?

It is impossible to say when the first strike will come. The internet is already in use as a weapon, but it is still relatively primitive. It is this ambiguity when discussing a tool of such potential devastation that adds a sense of urgency to addressing or at least identifying hard threats. One thing is certain, though, the internet will continue to develop in the coming years

and its importance and incorporation into daily life will only expand. The threat is not going to lessen.

What's the impact?

As our society becomes more wired and more cyber-dependent every day, we become more vulnerable. While the internet continues to make life easier, more expedient and more practical, the vast security gaps that it provides, the backdoors into society that it opens are overlooked. These are extremely dangerous and the more the internet evolves and grows without at least a system in place to monitor it, the more potentially devastating the ramifications may be.

Why think now?

Wielding the internet as a weapon will be an acquired and developed skill – therefore to successfully and effectively respond, measures must already be in place. Such a quick strike leaves little room to be reactive so governments and agencies must be proactive to successfully defend against techno threats. History shows that humans have to be roused to action by the effects of some devastating event, but the potential for catastrophe is too great to be ignored, and the response itself may even be too little too late. The post-9/11 world is moving too quickly for bureaucracies to be reactive, and any sort of cyber defense agency would take years to develop, so starting to think now is critical to being safe tomorrow.

Example Scenario: LAX 2023

The scene was chaos. Half of terminal 3 sat engulfed in flames and the Tom Bradley International Terminal was a tangled mess of beams, collapsed ceiling, and smoke. Confused and scattered first response units tried desperately to organize some sort of rescue, but radios were useless and a command station had yet to be established. Eye witnesses were able to piece together a rough sketch of what had taken place. What workers at the near-by power station were calling a “sever glitch” in the network had caused a blackout in the surrounding grid, which included LAX. In the power outage that followed, a few would-be travelers, who had been relaxing in Terminal 4, reported seeing a small, low flying air craft (air traffic control was unable to pick up because of the outage) fly directly towards the international terminal, followed by a deafening explosion and the chaos that ensued.

Conclusion

Cyber security is an increasingly pressing concern. While it is still relatively limited in its uses throughout the world, the next ten to twenty years will see the internet mature rapidly and the world will likely become extensively wired and cyber-dependent. For all the upside it has, there is still potential to do harm with its power. The knowledge and skills are there. The pioneers of this techno-age do not want to see the fruits of their labors used for to harm and destroy, and their intellect could be called upon to develop the means to repel any cyberstrikes. This is an issue that the world is fully capable of addressing, and should to prevent the devastation that could be cause by the World Wide Web.

Security Impacts of Technology Transfer

Bruce T. McWilliams

The worst outcome of this FCI would be a decisive loss in a large-scale war. This would result from unintentional technology flows to existing or potential threats to U.S. security interests. These technology flows include sensitive information embodied in physical objects, codified technical knowledge or the tacit knowledge in a U.S.-educated scientist or engineer. A turning point could occur when legitimate dual-use trade between the U.S. and a reliable trading

partner is rapidly and unpredictably transformed. For instance, this once reliable trading partner might undergo a regime change that relies on diplomatic subterfuge to shift the country's relationship from one of full cooperation to direct conflict. Furthermore, this country's interests are sufficiently great and directly clash with those of the U.S., thus leading to quick diplomatic reversals, economic regression and war. The U.S. would recognize far too late that sufficient technology to undermine U.S. security interests had already been released legitimately or had already diffused uncontrollably. Specific future challenges appear to be the diffusion of such critical technologies to China, India, and to a lesser degree, Russia and Brazil. A best and worst case scenario with respect to China will be discussed below.

Most Pessimistic Scenario

In the year 2029, after 25 years of generally favorable globalization and economic interdependence, China still holds its most-favored nation status with the U.S. and is still a member of the World Trade Organization. Its GNP has grown at rates greater than 5% for more than twenty-five years. Its relationship with the United States, its largest trading partner, has generally been cordial. Lately, though, it has faced much higher relative world prices for raw materials, such as oil, iron ore, and specialty metals, as well as had to resort to massive agricultural imports. By 2026, in spite of the promise of the Kuznet's curve's prediction that economic progress would curb its population growth rates, unsustainably high net fertility rates still exist. With a base population of 1.3 billion in 2004, these small percentages generate an excessive appetite for food that has outstripped agricultural productivity gains. Consequently, the increased pressure on its own domestic agricultural production to meet this need have increased the centuries-old frictions between the rural west and the eastern cities. These frictions plus the frustration over lower growth rates have put the country on a conservative path. As a result, a cadre of Chinese leaders with a strong sense of nationalism and a penchant for tapping into the illusions of a Middle Kingdom utopia is installed. The world community grows wary, but not overly concerned. Russia does not immediately turn off its oil pipelines to China. This cadre, however, knows of China's problems better than the outside world, having helped distort Chinese public economic figures for decades. China has previously never exerted undue influence beyond the centuries old boundaries of its traditional hegemony. However, out of desperation, they now consider expansionistic foreign policies and pull out a well-considered but risky war plan. In doing so, they immediately face a significant problem. For many years, China has been shifting from a coal-based energy economy to a hydropower and oil-based economy, in spite of having limited internal sources of oil. The transformation to an oil-based economy has both increased their dependency on it – a strategic disadvantage, while increasing the mobility and effectiveness of their armed forces – a strategic advantage. In an older version of this war plan, they intended to conquer the Spratly Islands, which they have long claimed lies within this tradition hegemony.²¹ However, they know that this conquest will obviously offend the international community, and since the oil reserves from this region are still unknown, this conquest might only alleviate some of their energy needs. In desperation, they think bigger. Having acquired improved nuclear technology and shipbuilding capacity in a modular way, they know they could rapidly develop a “blue water” navy – a type of navy they had previously claimed they would never develop. With it, they know they could successfully challenge the

²¹ “The 2002 ‘Declaration on the Conduct of Parties in the South China Sea,’ which has eased tensions [in the region] but falls short of a legally binding ‘code of conduct’...” (CIA World Factbook Web page).

United States control of the sea and control the shipping routes to the oil ports in the Middle East and Alaska. They just need time to put these two together. With the launching of aircraft carrier task groups on these targets, the war plan calls for simultaneously moving their army into the oil regions of Central Asia. This is something they believe they could do with relative ease, because the plan also counts on the U.S. and Russia, with aging populations and weak political nerve, to be ineffective or untimely in any effort to stop them. They estimate that both elements of this theater strategy would require three months, the time required to convert several oil tanker hulls conveniently lying in their shipyards into aircraft carriers. The required escort ships already exist in their non-blue water navy and are already as effective as any similarly sized U.S. navy vessel. This is because they acquired the necessary technologies through Taiwan's navy, which they obtained when they absorbed the country into the mainland in 2012. Their air force has also been under constant development and is likewise competitive with any other country. So, with the exception of a navy capable of going on the offensive, every other piece of their offensive force has been put into place in plain sight. The cadre knows, however, that the U.S. satellite capabilities are still sufficiently great that they would not be able convert their hulls to aircraft carriers covertly. Thus, they come up with a wrinkle in their plan. Because China had quietly walked away from the nuclear proliferation treaties years earlier, they would declare the initiation of a nuclear missile program again. Naturally, this step would not result in the international community's love for this cadre, but the community would still prove to be ineffective in preventing this regression. Finally, three months prior to their armed offensive they would begin their ship conversion project in the following manner. Their ostensible nuclear missile program would casually launch a nuclear warhead high into the atmosphere knocking out all the low earth satellites on one side of the earth (an event possibly explained by Caleb's FCI). However, it would cause no detrimental effects to anything on the ground. The U.S. would obviously be furious at the loss of these satellites, but the Chinese would explain this as a clumsy accident. In the international court reviewing this event, they would state they are willing to pay reparations for them. With no other signs of overt mobilization, this excuse would be reluctantly accepted as Chernobyl-like bumbling. Thus, without any observation from above, they would buy themselves the time needed to convert their hulls to aircraft carriers. Before the satellites were brought up again, the Chinese would attack the U.S. fleets in the Pacific and Indian Oceans conventionally in a surprise attack.²² Both Russian and U.S. armies counterattack, but are not sufficiently strong to prevent the Chinese from controlling the major sources of oil. Escalation to a nuclear response is short-circuited by both sides belief in the doctrine of mutually assured destruction. Once in full control of the sources of oil, the Chinese would threaten the entire world economy by threatening to let the economies of all the developed nations crumble by turning off the oil spigot.

Best Case Scenario

This scenario rests on two factors. The first is that within China there is a sufficiently strong and universally held belief in the market mechanism. The second is that Chinese governance successfully suppresses nationalistic political impulses. The first would permit a constructive reaction to rising resource and raw material costs, so that these higher prices would naturally slow down the economy. With a pervading belief in the market system, the prices would be accepted internally, albeit reluctantly, by Chinese businesses without extraordinary political

²² Alternatively, the Chinese would wait until after the low-earth satellite systems were restored and simply hide their aircraft carriers. This approach would be much more prone to intelligence leaks and be a riskier approach.

strife. China would slow down, the economic order would remain undisturbed, and a sustainable growth rate could be achieved.

Analysis

The critical events in the pessimistic scenario are not only the tactical mistakes connected to letting all of the United States low-earth satellites get knocked out simultaneously, but several more strategic ones. The most obvious of these would be permitting the Chinese to build up all of their other complementary offensive capabilities in plain sight. Another less obvious one would be the accumulation of small decisions over time regarding technology transfer. The relevant oversight groups through poor coordination would fail to recognize how much technical knowledge had been transferred to China through trade in dual-use technologies and the army of scientists and engineers previously trained in the United States. They would also poorly estimate how well the Chinese could actively extend and rapidly build on these acquired technologies. Thus, by 2029 the United States would no longer be the technical leader in all the critical fields. With low population growth especially among younger populations and reduced immigration flows, it would fundamentally no longer have the manpower to keep up with the technical capabilities of China. Another not so obvious strategic mistake would be not having policies sufficiently supportive of China nurturing a universal belief in the market system. Without these values, buy-in by the Chinese business community to letting the world price-system work unfettered might not occur, thus leading to more drastic and dangerous political reactions. A final strategic error would be diplomatic gestures by the U.S. that were not sufficiently constructive to repress Chinese governance feeding off nationalistic impulses driven by unmet expectations from too rapid economic growth.

Space Arms Race

Caleb Patten

Introduction

The dominance maintained by the US military is made possible in large part by satellite technology. Satellites are integral parts of the US military's superior Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) systems. C4ISR is a critical component of Department of Defense (DoD) goals of "force transformation" and "net-centric warfare". The US increasingly uses advanced satellite technology in combat. During Operation Enduring Freedom, 90% of munitions were precision guided compared to 10% during Operation Desert Storm (ODS). One third of the 30,000 munitions used during Operation Iraqi Freedom (OIF) were Global Positioning System (GPS) guided. During OIF, GPS receivers were deployed one for every nine soldiers compared to one for every 180 soldiers during ODS.

While satellite systems are integral parts of US security strategy, they themselves are not secure and could come under attack in the next decade. This emerging vulnerability is the basis for recent policy documents from the Air Force (USAF) and Pentagon indicating a shift in doctrine towards preemptive space warfare. This shift in policy combined with proliferation of advanced satellite weapons and technology could lead to an FCI of a space arms race.

Emerging Space Security Challenges

Space warfare is not a new concept. Both the US and Russia developed anti-satellite (ASAT) weapons in the 1960s. While the Anti-Ballistic Missile (ABM) treaty in 1972 specifically forbids development, testing or deployment of space-based missile defense systems, efforts to develop space based defense systems persisted (e.g., President Reagan's Strategic Defense Initiative or "Star Wars"). The reigning Soviet-American consensus was not in favor of

developing ASAT weapons because satellite systems were critical components of detecting and responding to a nuclear attack and therefore necessary for nuclear deterrence. In 2001, Defense Secretary-designate Donald Rumsfeld chaired the Pentagon Space Commission that warned of a "space Pearl Harbor" and that the only way to prevent it would be to "vigorously pursue the capabilities ... to ensure that the President will have the option to deploy weapons in space." Following the 9/11 terrorist attacks, the Bush administration embracing preemption over deterrence, exercised the United States' ability to unilaterally withdraw from the ABM treaty, opening all forms of research and development for space based defense systems. Since then, a number of recent US policy documents have given new priority and clarity to US space warfare capabilities. In November of 2003, the "USAF Transformation Flight Plan" outlined the range of possible uses of space-based weapons systems and their priority for future plans.²³ Whereas the previous document outlined possibilities and priorities, the next major space policy document, "Air Force Doctrine Document 2-2.1: Counterspace Operations" established in clear language a preemptive doctrine of space warfare:

“Potential adversaries have access to a range of space systems and services that could threaten our forces and national interests. Even an adversary without indigenous space assets may use space through U.S., allied, commercial or consortium space services. These services include precision navigation, high-resolution imagery, environmental monitoring, and satellite communications. Denying adversary access to space capability and protecting U.S. and friendly space capability may require taking the initiative to preempt or otherwise impeded an adversary.”²⁴

The USAF in outlining its new doctrine identified the following methods by which US space assets might be attacked:

- Ground system attack and sabotage using conventional and unconventional means against terrestrial nodes and supporting infrastructure.
- Radio frequency (RF) jamming equipment capable of interfering with space system links.
- Laser systems capable of temporarily or permanently degrading or destroying satellite subsystems, thus interfering with satellite mission performance.
- Electromagnetic pulse (EMP) weapons capable of degrading or destroying satellite and/or ground system electronics.
- Kinetic antisatellite (ASAT) weapons capable of destroying spacecraft or degrading their ability to perform their missions.
- Information operations (IO) capabilities capable of corrupting space-based and terrestrial-based computer systems utilized to control satellite functions and to collect, process, and disseminate mission data.

Complicating the issue of space security is the increasing complexity and convergence between private and public sector space satellites. The US military relies heavily on commercial satellites to help it evaluate infrastructure in foreign countries, monitor border activities, conduct

²³ United States Air Force, "The U.S. Air Force Transformation Flight Plan", November, 2003. Available on-line at: http://www.af.mil/library/posture/AF_TRANS_FLIGHT_PLAN-2003.pdf

²⁴ United States Air Force, "Air Force Doctrine Document 2-2.1: Counterspace Operations", August 2004. Available on-line at: http://www.dtic.mil/doctrine/jel/service_pubs/afdd2_2_1.pdf

surveillance with aerial drones and relay information to mobile command stations. During Operation Iraqi Freedom, commercial satellite networks provided 80% of military communications. The Defense Department spends an estimated \$400 million to \$500 million a year to lease bandwidth from private satellites.²⁵ DoD demands for satellite broadband are increasing rapidly. For example, a single Global Hawk unmanned aerial vehicle (UAV) requires approximately 500 megabits per second, five times the total bandwidth required by the entire US military during ODS.²⁶ This increasing reliance on private satellites creates a difficult challenge from a security standpoint when you consider that adversaries could be relying on the very same satellite. The same satellite used by Osama bin Laden for cell phone calls could theoretically have been used by the UAVs that were hunting him.

The sophistication of commercially available satellite technology is advancing rapidly. Russian, Israeli, French and American corporations offer high-resolution images rivaling US government capabilities. During the first Gulf War, the United States was able to persuade these nations to restrict Iraq's access to high-resolution imagery that could have endangered US troops.²⁷ The recent success of SpaceShipOne in the Ansari-X prize makes it the first privately owned and built manned spacecraft to reach outer space. The continued advances and internationalization of high-tech satellite technology will make international public-private cooperation in space more important.

The miniaturization of satellites is an example of an advancement in satellite technology that could contribute to future space-based warfare challenges. Micro-satellites are generally considered to be satellites with a mass of less than 500 kg (1,100 pounds). They are further subdivided into mini- (100-500 kg), micro- (10-100 kg), nano- (1-10 kg), and pico-satellites (< 1 kg). To put these masses in perspective, the Hubble Space Telescope has a mass of 11,000 kg. Future uses of micro-satellites could include examining and identifying other satellites, mines, and search and destroy missions.²⁸

Micro-satellites are cheaper and easier to build than larger satellites making them accessible to more nations. Approximately 30 nations have launched micro-satellites and this number is expected to grow rapidly. They can also be deployed more easily by a wider variety of launch platforms making it possible for non space-faring nations to launch their own satellites. Perhaps most troublesome, micro-satellites are not detectable by US space surveillance systems.

Corporations such as the British Surrey Satellite Technology Ltd are disseminating micro-satellite technology by building satellites for other countries (subject to British export controls). The company also has a technology transfer program designed to help countries develop the capability to build their own satellites. Participants in this program include Pakistan, South Africa, South Korea, Portugal, Chile, Thailand, Singapore, Malaysia, and China. Other collaborators include Algeria, Nigeria, and Turkey.²⁹

The CubeSat program is another way satellite technology is proliferated. Started in 1999 at Stanford University and California Polytechnic State University San Luis Obispo, the program

²⁵ Lohr, Greg A., "The launch of a more stable satellite industry?" *Washington Business Journal*, 23 January, 2004.

²⁶ Greg Jaffe, "Busy Signals: Modern Warfare Strains Capacity To Communicate – Shortage of Satellites Vexes U.S. Military Amid Surge In Data From Battlefields," *Wall Street Journal*, April 10, 2002, p.A1

²⁷ Federation of American Scientists, "Ensuring America's Space Security Report of the FAS Panel on Weapons in Space", September 2004.

²⁸ Ibid.

²⁹ Ibid.

builds pico-satellites with a maximum mass of 1 kg typically costing less than \$40,000 to build. Over 50 colleges and universities are currently working on such satellites.³⁰

The Rumsfeld Space Commission was concerned with future micro-satellite weapons and concluded the following:

- "Advances in miniaturization and the proliferation of space technologies create opportunities for many countries to enter space with small, lightweight, inexpensive and highly capable systems that can perform a variety of missions."
- "Micro-satellites can perform satellite inspection, imaging and other functions and could be adapted as weapons."

"There are examples of plans to use micro-satellite technology to develop and deploy long-duration orbital ASAT interceptors."

Implications

The proliferation and advancements in satellite technology, coupled with the increasing importance and reliance on satellites for strategic and tactical missions point towards a new battlefield in space. How the US approaches this battlefield will have significant implications on US national security.

As the US continues to develop space-based weapons systems and a national missile defense (NMD) system, other potential adversarial nations could find their deterrent position weakened and have no choice but to acquire their own weapons triggering a space arms race. This scenario is not implausible at all, as China, Russia, North Korea, Iran, India and Pakistan all maintain the interest if not capabilities to deploy weapons in space. China has expressed specific concern for how US NMD might undercut its nuclear deterrent. The Chinese ambassador to the Conference on Disarmament warned that the deployment of space weapons would "jeopardize the global strategic balance and stability" and "trigger off ... another round of arms race."³¹

Because a NMD system and the strength of the entire US military is largely enabled by satellite technology, adversaries could choose to strike at it because it is the weakest point in our defenses. Moreover, as US policy continues to treat space-based weapons as inevitable, other nations will have no choice but to develop their own. The continued proliferation of the technology will make this easier and cheaper to do so in the future.

There are important parallels between the threats posed by space-based weapons and Weapons of Mass Destruction (WMD). In both cases, it is important to distinguish between the different levels of capability and intent of our adversaries. In addition, it is important to evaluate the way in which US defense posture affects its adversaries' capabilities and intent. For example, the deployment of space-based weapons might provide more capability to other nations through technology transfer, espionage and commercial trade. Or, to what degree does developing a defensive system to address a *future* threat actually contribute to that threat's maturation?

Another important impact of the weaponization of space is that it would destabilize an important driver of the information revolution and globalization. Satellites are used for a growing number of civilian uses from navigation to meteorology to agricultural development.

The US military is currently preparing for space warfare, but the implications of these preparations have not been accurately determined. While the emerging threat to US space

³⁰ Ibid.

³¹ Statement By Mr. Hu Xiaodi Ambassador For Disarmament Affairs of China at The Plenary of The Conference On Disarmament, June 15, 2000. <http://www.chinaembassy.se/eng/5229.html>

systems needs to be addressed, it does not necessarily need to be a primarily military response. A number of policy recommendations can be implemented while simultaneously evaluating the need for, and impact of, space weaponization. The US should harden critical space systems with redundancy, orbital placement and radiation hardening. Quick launch capabilities and redundant systems should be in place to minimize damage in the event of the loss of a critical system. The US should take the lead in establishing international agreements for space systems including what type of action should be considered threatening in space. Situational awareness in space needs to be improved to include micro-satellites. These are all examples of policy measures that would help secure space for all space faring nations without initiating a new arms race.

Carefully considering the implications of today's policy decisions is an important part of avoiding undesirable FCIs like a space arms race.

The Rise of Transnational Criminal Groups—A Threat to International Security

Rebecca Patterson

The threat posed by crime is not a new one. What is new, however, is the profitability of criminal activities in a world in which governments are weak, and opportunities for crime have grown exponentially. In this environment, the ability of criminal organizations to challenge the sovereignty of states is a reality. It is also a harsh reality that the profitability of these organizations is also a threat to the global economy, global health and international security.

Globalization has had a tremendous effect on the world economy. Goods, services, people and ideas move across national borders, bringing new opportunities for trade, cultural contacts, and enhanced quality of international life. On the other hand, new illegal elements have established criminal networks—and terrorist groups as well—that are able to take advantage of these trends more quickly and effectively than governments. Just as business modernized and internationalized, so did transnational criminal organizations.

Proceeds of transnational organized crime are estimated at between 1 and 1.5 trillion dollars per year, exceeding the gross domestic product of all but a handful of developed countries.³² Narcotics trafficking is estimated to generate approximately 500 billion dollars per year in illicit income. Human trafficking has become a business of smuggling some 4 million people a year, resulting in tens of billions of dollars of profits for the criminal groups who perform these acts. Transnational criminal organizations earn 7 billion dollars per year trafficking in women and children along.³³ Human trafficking organizations use many of the same routes and methods employed by drug trafficking organizations. Once weak points in transportation, border and customs systems are established and solidified, the type of product trafficked—human, natural, or manufactured makes little difference. The ability of transnational criminal groups to exploit these established smuggling routes creates an opportunity for their cooperation with terrorist groups that are interested in smuggling personnel, equipment or weapons of mass destruction across borders.

Much illegal activity originates in poor, less developed countries and moves across borders to rich, developed country markets. Criminal organizations take advantage of and promote the frailties of governing systems in developing countries in order to make their

³² Levitsky, Melyn, "Transnational Criminal Networks and International Security" *Syracuse Journal of International Law and Commerce*. Summer 2003. 30:2, p. 228.

³³ Levitsky, p.228

headquarters and sources of supply more secure from intervention. Their ease of operation is directly related to the weakness of less developed countries' criminal justice systems. Criminal organizations bribe and threaten politicians, legislators, judges and journalists to protect themselves and their activities.

The profitability of marketing illicit products generates such income that trafficking networks are often able to outspend and outmaneuver the government agencies pitted against them. Their bottomless pockets mean that they can move and shift their operations at will to evade local enforcement and to seek venues that are more amicable, where enforcement is lax, inadequate or pliable. They can use their resources to influence the highest levels of government and to sway public opinion.

Unlike traditional, hierarchical organized crime groups like the Italian and American mafias, modern transnational crime has decentralized and diversified its activities, flattened and networked its operations and regularly engaged in "transactional alliances." For example, Columbian cartels have struck working relationships with the Italian mafia, Mexican criminal groups, the Chinese triads, various Russian and Eastern European groups and the IRA. This is nothing preventing further cooperation between criminal groups and terrorists if the situation is profitable for both.

With no formal laws, rules, regulations, or ethical principles to hinder their operations, international crime groups have been able to take advantage of modern technology even more quickly than transnational business groups and much more effectively than governments operating under the constraints of domestic and international law. The use of the Internet, off-the-shelf encryption techniques, and one-time-only cellular phones to protect their deal making and communications has allowed the modern, networked international criminal organization to further widen the advantage they hold over governmental and multilateral institutions.

The consequences of these transnational organized crime groups are the undermining of political structures, the world economy and the social order of the countries in which they are based and operate. The resulting instability invites more crime, and may preclude the rule of law and legitimate markets; it also undermines civil society and human rights.

The threat from these organizations is a threat to the sovereignty of individual countries, and in some cases their survival. The direct threat comes from the ability of major criminal gangs overtly to challenge governments, either through violence, intimidation or corruption. Some criminal groups have been willing to wage near-open civil warfare against the main institutions of government to block efforts to enforce law and end illegal activities. These organizations also have the ability to suborn public officials charged with enforcing the law against them. The criminal purpose may not be to subvert the government but to protect illegal enterprise from unwanted interference. Corruption can be so pervasive that police and military officials actively protect criminal enterprises against other elements of the governments. The cumulative effect of these realities is to undermine the integrity of government and thus national sovereignty. Once a state's government has been suborned by corruption, it is the perfecting operating environment for criminal groups and terrorists to operate.

The danger that transnational criminal groups pose to international security is significant. If the trend continues, the future of our national security may depend more on our ability to fight these organizations than our ability to fight foreign armies. Transnational crime groups are adept at diversifying and expanding their portfolio of activities. Although typically thought of as dangerous with respect to drug, human and small arms trafficking, there is truly no end to the activities that are profitable for these groups to undertake. From smuggling fauna and flora,

critical infrastructure plans, nuclear or biological materials, to becoming cyber terrorists for hire, there is no end to the possibilities of the threats these groups may pose in the future. As long as there is money to be made and these organizations continue to exploit their financial, legal, moral, and technological advantages, they will increasingly threaten the stability of the entire world.

The Problems and Prospects of Private Military Corporations

Joshua Aaron Vogel

With the collapse of the Berlin Wall and the End of the Cold War, the United States, Russia, and other powers downsized their militaries (America's armed forces have shrunk from roughly 30% from 1991 to 2004), creating a massive pool of unemployed former service members. For many of them, private military corporations (PMCs) provide a good way to make a living. Trained former service members can make a difference, especially today when the majority of wars are not interstate battles but conflicts within nations and against transnational actors.

The United States has a history of dispatching private military companies to handle the dirtiest foreign assignments. The Pentagon quietly hired for-profit firms to train Vietnamese troops, and the CIA secretly used private companies to transport weapons to the Nicaraguan contras during the 1980s. But as the George W. Bush's Administration replaces record numbers of soldiers with contractors, it creates more opportunities for private firms to carry out clandestine operations banned by Congress or unpopular with the public. Private military contractors are the new "business face" of war, providing everything from logistical support to battlefield training and military advice at home and abroad. The hard fact is that the Pentagon cannot go to war without them. The shift in policy (Executive Order 12333) occurred during the Reagan-Bush period under which so-called "national security" and "intelligence" functions were allowed to be "privatized."

The presence of civilians accompanying the force on the battlefield has legal and ethical ramifications and raises troubling questions relating to issues of chain of command, authority, accountability, force protection, and, ultimately, mission effectiveness. This provokes discussion about the growth of the privatized military industry and the reliance on civilians in the realm of military training, international security missions, and peacekeeping operations. Estimates of the number of private international security personnel in Iraq today, range from 15,000 to 20,000. That is as much as 15 percent of the total US presence and they make up the second largest contingent of troops in the coalition. According to some estimates, private military companies will double their business by the end of the decade, to \$200 billion a year.

Systemic Trends:

Three main explanatory factors have been proposed for the accelerated growth of these companies over the past two decades:

- Increased demand generated by the outbreak of low intensity/transnational conflicts in the Third World where fragile regimes can no longer count on the financial and military support of one of the two superpowers.
- The second factor seems to be a decreased willingness of the US government to engage in international peacekeeping operations unless their immediate security interests are concerned due to overextension.
- The third factor concerns the reduction of defense budgets and the outsourcing of military tasks to private companies.

Advantages of PMCs:

PMCs claim they offer several advantages to national governments:

- Outsourcing of some military posts saves governments money, because the companies operate more efficiently, provide fewer benefits to their employees, do not have the pension liabilities of the U.S. armed forces, and more effectively utilize people's areas of expertise.
- Private companies also are willing (for a price) to step into places shunned by national armies and multilateral coalitions. Recognizing that private firms often are the only hope for war-torn nations, some U.N. officials and aid workers have given limited praise to the private soldiers.
- For their part, many PMCs argue there is no need for legislation, because free market incentives will force the companies to regulate themselves: They would be unable to win contracts if their reputations became tarnished.

Disadvantages of PMCs:

- PMCs are not only less committed but also less accountable and easier to use for operations the Pentagon may not want to acknowledge.
- Congress exercises much less oversight of the private contractors, unless something terrible happens, and the PMCs don't feel the same pressure to respect human rights.
- Privatization could become a way of going around Congress and not telling the public of military interdiction.
- PMCs sometimes do not provide the promised cost savings. If there were true competition, there would be savings, but often the Pentagon just gives one PMC the contract without competition, so the price is high and mistakes are more likely.
- Issues over challenges to sovereignty, the militarization of society, criminal activity, the exploitation of natural resources as well as problems of transparency and accountability.
- For the most part, firms proceed without sufficient accountability or oversight. Many firms do not properly screen those they hire to United Nations Commission on Human Rights

Political Implications:

The Pentagon has become so dependent on private military companies that it literally cannot wage war without them. Troops already rely on for-profit contractors to maintain 28 percent of all weapons systems. The push to privatize war is swiftly turning the military-industrial complex of old into something even more far-reaching: a complex of military industries that do everything but fire weapons. Private military companies, for their part, are focusing much of their manpower on Capitol Hill. Many are staffed with retired military officers who are well connected at the Pentagon, putting them in a prime position to influence government policy and drive more business to their firms.

Congress has chosen to delegate a large portion of that power to the executive branch. This delegation is constitutional under current Supreme Court doctrines, but it is unclear whether it is completely wise from a policy perspective. The new privateers' role in U.S. foreign policy is growing both quantitatively with privateering companies bearing a larger proportion of the burden of achieving American security goals overseas and qualitatively with these companies taking over operations once left exclusively to men and women in uniform.

Congress should re-evaluate an outmoded regulatory scheme designed primarily to deal with one-time sales of military goods. If privatized war making is the future congress must provide for the same ongoing executive branch supervision, congressional oversight, and public accountability applied to ordinary military operations. An analysis shows that 17 of the nation's leading private military firms have invested more than \$12.4 million in congressional and

presidential campaigns since 1999. In 2001, according to the most recent federal disclosure forms, ten private military companies spent more than \$32 million on lobbying.

Demand for PMCs is rising sharply. According to a study by Equitable Services, a company that analyzes the security industry, revenues from the global international security market will increase from \$55.6 billion in 1990 to \$202 billion in 2010. The Department of Defense (DoD) now reportedly has more than 700,000 full-time and part-time contractors on its payroll.

Future Outcomes/Developments:

The trend of growth of PMCs is steadily rising and reached a fevered pitch in recent years. This has come at a time in which the military relies heavily on PMCs to provide support and logistics to facets of life and combat. This could have long term implications and outcomes, some of which are listed below.

- *A wrench in the Revolving Door:* After years of allowing PMCs to build up a system in which high ranking soldiers go to private industry instead of staying in the military, Congress saw it fit to change wages for the US military. The belief was that the best military in the world should be by far and away the best paid military. In the wake of years of cuts to military spending, the average wage of soldiers was doubled over a five year period. This also cost only a fraction of the costs associated with PMCs who had been found to over bill and under serve the military. New enrollment in the military increased by 20% and re-enlistments were near 100%. No longer was it necessary for soldiers with years of training of expensive training and experience to go private for economic sufficiency. Most soldiers stayed in uniform five years longer. This increase in pay was coupled with increased Congressional oversight of PMCs in the wake of fraud allegations. The belief that outsourcing of the military was prudent and necessary faded after many legislators realized that contracts were costing more than if we did it ourselves and depriving the military of some of its best minds. It infuriated many legislators when it was found that the government paid on time even when the work done shoddy at best. PMCs must now report monthly on their mission status to the Pentagon and the House Armed Services Committee and a system was been developed in which companies that do not meet their objectives are given a “bond rating.” Anything below an “A” isn’t allowed to get contracts from the military. The increased accountability has helped to reign in some of the poor work done by PMCs and kept more soldiers in uniform.
- *Ideological PMCs:* In the wake of growing global discontent and religious strife, PMCs metamorphosed into factions with definitive ideology, which has manifested itself in a religious nature. Realizing that a “clash of civilizations” could be underway, many officers of strict religious conviction have turned to PMCs as a new form of evangelical mission work. Many of these religious based PMCs moved their bases of operation to areas of the world that have little to no regulation and yet is still close to the United States such as the Cayman Islands. These new Crusaders work covertly with the US government which, still maintains good relations with many of the owners and soldiers in the religious PMCs. The Pentagon has taken advantage of giving out many contracts under \$50 million, so they do not have to report it to Congress. PMCs allow the military to pay for missions that are politically unviable. The Christian soldiers work in all areas of the world fighting Muslim insurgents groups and terrorists groups. US government officials, too afraid to stop groups who are fighting battles that would normally be fought by conventional forces and leery of offending religious voters, have chosen to allow this to happen. As a byproduct, terrorists have begun

to do the same. Muslim terrorist groups have started their own PMCs as military wings. They recruit heavily from the Pakistani, Egyptian, and Indonesian Armies. Though not nearly as well trained as US troops, these Muslim PMCs are better trained troops who can better directly engage the West in battle. These new PMCs have created a chaotic world in which soldiers for hire can be bought to fight religious wars between states.

- *Internationalization for Global Security*: The UN, well aware of the price of low intensity conflict and wary of the lack of international regulation of PMCs decides to update its Convention on Mercenaries through additional protocols that bring greater definitional clarity and creates a permanent monitoring and enforcement structure modeled on the UN Conventional Arms register. A register for PMCs would help sift the “good guys” from the “bad guys” and rein in PMCs that aid terrorist networks. Private military corporations could then be of greater use to international organizations. The private sector is already active and effective in many key areas like de-mining. The cost of employing private military companies for certain functions like this in UN operations could be cheaper, quicker, more effective, and less politically derisive than national armed forces. This would allow for the UN to take a more active role in world politics and increase their power on the world stage.