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ThinkFest: Exploring Future National and Global Security Issues

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ABSTRACT

The Sandia National Laboratories' Advanced Concept's Group hosted a "ThinkFest" on August 6-7, 2002, with the goal of bringing together a diverse set of individuals from within Sandia and from other organizations' think-tanks to explore possible future national security problems for the United States and the World. The result was a freewheeling, wide-ranging discussion and characterization of potential futures and threats to national security. This report documents the process utilized for this fest and present the results generated in a basically unedited form.

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ThinkFest: Exploring Future National and Global Security Issues

EXECUTIVE SUMMARY

At its beginning, the ACG identified a wide range of possible future national security threats, then focused its efforts on understanding and developing “system solutions” for these. The events of September 11, 2002, suddenly shifted our focus entirely onto the War on Terrorism. Although terrorism will obviously remain a major concern, it is time once again to reassess the ACG “problem space” and plan where to go next.

We started the process by visiting several other think tanks to help us identify a new problem set, and possibly to join us in some collaborative projects. The groups we invited responded enthusiastically, in part because none of them had a systematic process for selecting their own future areas of focus. Using its outstanding facilities for collaborative activities, the ACG has held several workshops that we call “fests.” We’ve had the *SciFi Fest*, the *CorpFest*, and two *Healthcare Fests*. This time it was *ThinkFest: Exploring Future National and Global Security Issues*, held on August 6 and 7, 2002.

The goals for our *ThinkFest* were:

- Explore possible new problems that we might address
- Explore possible collaborations with other Think Tanks on one or more of these new problems.

Each organization was invited to send up to four people representing different areas of expertise. The organizations were: CIA Strategic Assessments Group, Center for Strategic and International Studies (CSIS), Potomac Institute for Policy Studies, New America Foundation, DOE, and LANL. About 20 Sandians joined the 14 visitors for this exercise.

We wanted the discussions to be broad in scope and yet structured enough to encourage dialogue. We also knew that our workspace allowed for large group sessions and four focused breakouts, so we decided to use four perspectives as an organizational approach:

1. Earth and its Resources
2. People and their Institutions
3. Technology and its Applications
4. Nations and their Interactions

Our purpose was not to arrive at a coherently elaborated set of issues, but to set off a “brainstorm” of ideas from which we might later select a few for intensive consideration.

We think everyone found this event thought provoking and useful. Since we did not design the process to converge on any subset of issues, this report simply details all the notes from the sessions. By way of summary, we can say that there was significant energy around issues relating to biotechnologies and how they could produce significant future problems, both through malevolent actions and through unforeseen consequences of well-intentioned applications. The combination of powerful, easily obtained computing with genetic (or nanotechnology) engineering seems to open up a whole new world of potential terrorist’s tools.

The growth in population and resource consumption around the world was also at the root of many potential problem areas, with water looming as a major issue and the difficulty of envisioning significant growth in worldwide economic activity without overtaxing our planet. Aging populations will stress the economies of many societies (including that of China) as they strive to fulfill social contracts with their elderly.

In the area of political-military security, uncertainties about the Arab states, the Middle East, the Indian-Pakistan conflict, China, and the overall trend of increasing resentment to US hegemony were core issues. Future conflicts may well center on ideas, not things, and technology has empowered adversaries with significant tools in both the tactical and the psychological battlefields. Globalization is redefining the concept of sovereignty, and the War on Terrorism could further reduce the ability of international organizations to serve a stabilizing role. WMD's will be available to non-state actors, and indirect warfare by attacking crops or infrastructure may occur.

So, we reaped a lot of ideas that we need to digest, and strengthened relationships with a collection of potential partners. We also feel that these relationships will help us keep abreast of emerging trends and better fulfill our role "to investigate potential contributions that Sandia National Laboratories might make to solve long-range future problems of the nation and the globe."

INTRODUCTION

The Advanced Concepts Group was formed in 1999 to investigate potential contributions that Sandia National Laboratories might make to solve long-range future problems of the nation and the globe.

The ACG uses an unusual approach for an institution of its kind. The four-step process looks like this:

1. Identify risks that might dominate the national agenda in the next ten to twenty years.
2. Use these future problems as driving forces to derive system solutions within the economic and political constraints of the future.
3. Identify advances in science and technology that would be needed to make the systems successful in preventing or mitigating those future problems.
4. Finally, look for contributions that Sandia National Laboratories might make.

Since then it has explored a number of national and global issues such as Water Shortage, Sustainability, Ultra Terrorism, Global Aging, Improving Public Health Surveillance, and the current War on Terrorism. In the summer of 2002, the ACG began a fresh look—starting at step one in the process—to consider what future problems we should investigate next. This process was started with a workshop, a *Thinkfest*, which included other national and global security think tanks into this discussion of future trends and problems.

This event was held in the spirit of exploring ideas, not of developing detailed problem statements or proposals. The following notes attempt to capture many of the ideas that were generated. The level of detail of the notes varies with the sub-groups and note-takers. In this compilation, notes that couldn't be deciphered were omitted. The ACG accepts responsibility and apologizes for any misconstruing of points the speakers were actually trying to make.

THE PROCESS

After some exploratory discussion of what the words “national security” might mean to members of the group, the workshop process was first to ask all participants to contribute to a general list of “national security” problems. Then the group proceeded to three successive sets of breakout sessions, each with four sub-groups. Each sub-group was to identify “national security” threats from one of four perspectives:

- Earth and its Resources
- People and their Institutions
- Technology and its Applications
- Nations and their Interactions.

During the first breakout session, the groups each discussed threats or problems that seemed to be most prominent from each perspective. Then, in the next two sessions, the perspectives were combined in sets, first of two, then of three, to encourage consideration of interactions among the kinds of problems previously identified and to stimulate formulation of additional problems.

DISCUSSIONS OF THE TERM “NATIONAL SECURITY”

The participants who attended the dinner held on August 5 were asked to discuss the question, “What do we mean by the term, *national security*?” The following notes from this discussion were presented to the full group at the beginning of the meeting. The purpose of this exercise was not to arrive at a group consensus on a definition of *national security*, but to make more explicit the various perspectives that the participants would be bringing to the meeting discussions. Following the “dinner” session notes in each section below are the comments elicited in the full meeting session the next morning.

National Security Should Include:

Dinner notes

- Military defense
 - Malevolent acts by outsiders
 - Shocks from aggressive foreign powers
 - Anything that provokes us into extraterritorial response or involves sovereignty
 - Anything that affects our capability to respond as above—like economy, education, ...
- Anything that threatens our maintenance of government and national level availability of basic needs of life (food, water, etc.)
- Anything that threatens our national interests AND of large enough scale—broad effects, outside our system abilities to respond
- Anything with the opportunity to make major detrimental change in our quality of life—including our ability to participate in our institutions
- Anything that affects our physical security and mental serenity?

Full session notes

- Other forms of attack than just military should be included—such as cyber attacks.
- Also included should be “second-tier” issues that shape the security environment.
- An example of a threat to “mental serenity” would be the postal anthrax attacks of 2001, which, while killing or harming only a few people, caused great public concern and considerable expense.
- Many have debated what should be included in “national security,” and most debates end pragmatically, allowing for the inclusion of synergistic solution spaces (i.e. not just military). In one debate, five different government agencies offered five different definitions, each tailored to that agency’s self-interest.
- One threat is technological change and the ubiquity of dangerous technological know-how.
- The definition should also include domestic factors such as education, health, and demographics.

- Military defense in the future may not be like today's—may include, for example, distributed agents rather than concentrated military forces. This should be kept in mind.
- There can be no clear dividing line between international defense and homeland security.
- If the definition is too broad, then we will have trouble saying any problem is not a national security problem.
- Although people are talking about military “defense,” we should remember that the US has an offensive posture, designed to maintain US hegemony; this is more demanding than just territorial defense of the US.
- One should include the moral aspect—willingness to fight, to take action in defense of principles, moral toughness.
- Sandia management is constantly faced with setting priorities—what we should not do, given that that we have many kinds of capabilities but limited resources. One of the dinner discussions distinguished primary vs. enabling national security goals, near-term vs. long-term problems. We needed rational portfolio management amongst these.
- The US has never fought a foreign war for defense of its own territory—rather, has projected power to create a more favorable world order. Just defending the homeland is easier than protecting a world order. (But the Japanese attacked Pearl Harbor and Hitler declared war on the US)
- There are economic threats stemming from the international competition for resources.
- The US has responsibilities in the rest of the world, for example in dealing with the economic divide in the world today. A strategy limited to putting in troops can actually increase instability—as with Saudi Arabia.
- We may be talking about threats to national well being as opposed to national security.

National Security Should not Include:

Dinner notes

- Peanut butter
- Labor unions
- Obesity
- Meteorites
- Domestic terrorism - criminal action only
- Domestic consumption and production
- Health, education, natural disasters, crime (except that scale can make anything a national security issue in the right environment)

Full session notes

- On the final point above: disagree that domestic terror, health, and large-scale crime should be excluded.
- Even domestically originated crime should be included if on a large enough scale. There are threats from within the national that also require Federal action.

- One unresolved question in some of the dinner discussions was whether a *national security* threat required a malevolent agent, or whether acts of nature or accidents should be included.
- There was some discussion of whether a problem that could be handled at the state level would not count as a *national security* problem, while one requiring Federal action would. Then the point was made that even for large-scale problems, the better actors to deal with them might be local rather than Federal.

Relationships between National and Global Security

Dinner notes

- Our national security depends on our global political leadership which requires our intervention in global issues
- Some things affect national security but defy national solutions—thus become global security issues
- Our national security has become more entwined with the security of other nations
 - Problems in other nations can flow into U.S.
 - Globalization entwines our economies
 - We are more dependent on other nations
 - To avoid policing the world, we need global stability

Full session notes

- We should remember that many Americans are more or less isolationist and do not accept the internationalist notions of national and global security.
- We talk of US leadership, but many foreign countries (including allies) do not want US leadership; instead, they resent US unilateralism.
- US security depends on global political cooperation, not global security.
- The US intervenes abroad too much, without careful consideration of US interests and the actual consequences of the issues involved for the U.S.
- This raises the question of what US international moral obligations are, such as whether we should stand by and watch Rwandans be massacred.
- Maybe the US should intervene when relative peers are involved, as opposed to lesser states.
- Failed states, arising from conditions of human misery, can lead to global instability and environmental damage, so simply ruling out humanitarian interventions would be a mistake even in geopolitical, as opposed to moral, terms.
- All these points remind one that we are dealing with highly complex, interrelated issues, requiring multi-disciplinary approaches—which would be a very big thing to accomplish.

INITIAL LIST OF PROBLEM TOPICS

Following the discussions of national and global security, all participants were invited to write problem topics for consideration during the workshop on the Advanced Concepts Group's wall size white board (pictured below). The participants were asked to enter their idea under one of the four perspectives areas given above. Over 90 ideas were generated during this exercise.



Participants generate the initial lists at the Big White Board



During this 45-minute session, participants added to the growing lists and sometimes added modifiers to other topical descriptions. Note takers utilized laptops to capture the ideas listed in this forum for use later in the workshop.



Gabriella Hernandez takes notes from the People & Their Institutions board.

The initial lists generated in this process are found in appendix C.

SESSION 1 BREAKOUTS

After a group session in which participants were given the opportunity to ask for clarification of the ideas presented at the boards, small groups were formed to explore these topics and bring back to the group some analysis or synthesis of this information. The groups were formed by self-selection with 2 guidelines—that folks divide in such a way as to mix the organizations and that the groups be approximately the same size (about 10 each). Each breakout session had a facilitator and note taker with a laptop to capture notes and aid in materials for presentation of the results of the discussions to the full group.

Session 1 Breakouts



Earth and its Resources

Discussion centered around the selected list of E&R issues and problem areas (Appendix C) suggested by participants prior to launching the breakout sessions. A modified interim list of issues and interdependency linkage was then developed (Appendix D), followed by development of the summary breakdown of E&R issues by the major critical resource and consumption driver categories given below.

Food

- Expanding population leading to stress in the food supply
- Reduction in agriculturally-productive land and availability of water due to development and mismanagement of land and water resources
- Malicious or natural introduction of pathogens that decrease crops or livestock
- Shift in climate leading to prolonged drought
- Regional conflict resulting (intentionally or otherwise) in interruptions in food production and distribution, with serious economic and social repercussions

Population & economic development

- The product of population and per capita resource demand (i.e., Resource Demand Intensity) drives resource consumption and subsequent supply/distribution stresses
- Resource Demand Intensity is a function of economic development and technological advances
- As Resource Demand Intensity increases in heavily populated developing countries (e.g., China, India, etc.) and moves toward the higher levels found in the US and other developed countries, competition among nations for limited and/or unequally-distributed resources will escalate regional problems and conflicts

Water

- Inadequate availability and distribution of clean water supplies leads to:
 - Potential conflict between/among nations, including war
 - Mass suffering [e.g., drought, sickness (water-borne illnesses), etc.]
 - Adverse economic development impacts [e.g. Turkey/Syria, Israel/anybody, US/Mexico]
- Decreases in water quality:
 - Renders arable land unproductive (e.g., salt build-up, etc.)
 - Poisons populations (e.g. arsenic in ground water wells in Bangladesh)
 - Increases incidence of water-borne diseases
 - Leads to health impacts, economic impacts, and population migrations

Energy

- Growing global energy demand supplied by fossil fuels
- Environmental concerns may lead to increased cost and/or demand for decreased use of fossil fuels
- Lack of balanced US energy portfolio results in heavy dependence on fossil fuels and on fuel supplier countries that may be unstable and/or unfriendly to US interests
- Consumption of fossil fuels without adequate atmospheric emissions safeguards may contribute significantly to global climate change, potentially resulting in increased weather extremes, rising sea levels, flooding, habitat destruction, desertification, agricultural production impacts, and increased activation/spread of temperature-dependent disease pathogens
- Expansion of thermoelectric power (fossil fuel or nuclear) generation capacity increases demand for fresh water to drive turbines or cool plants; so expansion is limited by cost, available water and water demand of other industries. If alternative sources of power/energy have not been developed, costs of energy and enabling resources will rise and standards of living will decrease.

Other Strategic Materials and Interdependencies Caused By Natural Disasters, Man-Made Disasters, And Other (Asteroid Strike, Etc.)

- Were also brought up, but not discussed for lack of time.

People and Their Institutions

The group spent some time dividing the large list of problems and topics into manageable categories (not necessarily the same categories as those in the plenary session above).

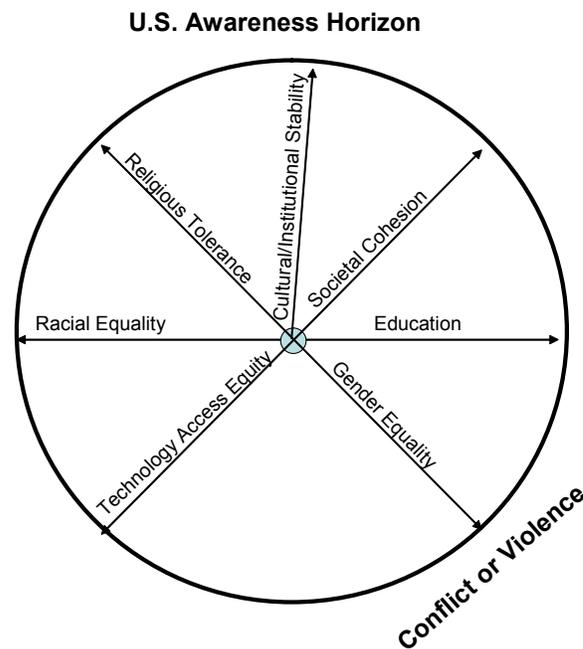
Economics

- Collapse of Chinese economy—and state?
- Risk of marginalization of countries economically, resulting in:
 - Inability to support democratization
 - Generation of internal unrest
- Shocks happen, including economic slow downs, depression, debt crisis, wars, terrorism with weapons of mass destruction.
- Economic security requires discipline in domestic policy economic management including:
 - Adapting social contracts in labor markets
 - Adapting individual rights and responsibilities
- Economic security increasingly requires a complementary foreign policy, including:
 - Peer pressure among the developed countries to maintain fiscal discipline
 - Engagement with the developing world including the promotion of middle classes

- Ensuring the quality of international institutions such as IMF, and the World Bank
- Development of stronger economic modeling capabilities
- Maintenance of a strong national defense

Culture

- acts as a set of beliefs, ideologies, social norms;
- is something that unites a particular group of people.
- In some cases immigration may lead to loss of single political culture; then political leaders' manipulation of myths or symbols to rally people to a common cause increasingly fail.
- The gender issue is hard to define and can be understood as a subset of culture; many times would be grouped under politics.
- The stability of a society is multi-dimensional: culture, religion, race, gender, ideology, education, technology are all important. While inequalities and extremes in any of these areas may not pose a potential instability individually, the combined effect may. See figure below.



- An implicit social contract maintains societal institutions. How might a transition to a new social contract come about? Some of the proposed problem topics might address this:
 - obsolescence of institutions and inability to adapt rapidly enough to avert crisis
 - spread of democracy
 - change in U.S. society from manufacturing to service oriented economy
 - loss of confidence in fundamental economic institutions
 - economic decline driven by global aging
 - aging in Developed Countries versus Developing World

- In many social, political, and academic institutions in general—the white male Anglo-Saxon power base is still dominant. Encourage others (women, blacks) add their voices and views to the decision making process.
- Demographic trends may destabilize traditional or familiar social relationships, threatening social order and well-being: aging, youth bulge, migration
- Declining confidence and increasing frustration with existing forms of governance fosters the growth of alternatives that threaten social order and well being: crime (international or transnational), religious fundamentalism, and tribalism.
- Various of the problem topics were experimentally grouped under the categories of “Law/Justice/ Governance,” “People and their Relationship to technology,” and “Health”
- On one hand, medicine continues to advance rapidly, greatly improving health and longevity—on the other hand there is a large inequity in the availability of modern medicine, whereby developed countries benefit while poorer countries do not, producing AIDS, malaria, TB, infant mortality, etc.
- Even with advances the current care delivery structures, both socialized and privatized, are not organized to handle emerging care needs, such as: long term care to the elderly, and potential health crises, e.g., human generated pandemics.



A typical breakout session in the back of the gameroom.

Technology and its Applications

- Genetic or bioengineering technologies that enhance human health or performance may be allocated to those who can afford them, widening inequalities in US society.
- Not just weapons of mass destruction, but perhaps “super weapons” of enormous or pervasive impact may become available to small groups or individuals Beyond the current weapons of mass destruction, new possibilities may be:
 - Self-replicating nano-“robots” that destroy the environment
 - High energy-density non-nuclear weapons

Genetic manipulation

- Information processing capability is increasing exponentially. That will enhance the opportunities for cooperation within and between states, but it will also greatly enhance the ability of state and sub-state actors to degrade elements of the US critical infrastructure. If the attackers prevail, modern industrialized states will not be able to maintain current levels of production. If the network defenders prevail, that will produce a great advantage over less advantaged states or actors, which may resort to physical attack to redress their disadvantage.

Nanotechnology

- Two possible future nanotechnology threats are:
 - Uncontrollable self replication, and,
 - In conjunction with IT and biotechnologies, the potential for creating powerful, independent, and sentient or quasi-sentient machines that can be used for malevolent ends.

Super Weapons

- If weapons of mass destruction exist, they will be used, sooner or later, earlier and forever.
- Plenty of people are still getting killed by clubbing, stabbing, strangling. Just because the technology is old doesn't mean it is still not being used.
- Old weapons are new weapons:
 - Biological – Turks catapulted bubonic plague bodies over enemy castle walls in the 15th century. Poisoning of wells is an ancient art, and meanwhile we face bio-arsenal accidents all the time.
 - Chemical weapons – first conceived of by Jules Verne in 1889, first used in 1915, used as late as 1988.
 - Nuclear weapons - first conceived, H. G. Wells 1913, first used 1945; threatened all the time since notably, 1956 and 1962. Proliferation still huge concern.

Life Sciences

- If the increasingly powerful and increasingly available genetic technology allows interest groups to
 - mass produce new behavior-modifying drugs,
 - tailor pathogens into superbugs highly contagious and vaccine resistant bio-weapons,
 - manipulate the human genome, then:
- The adversary will
 - have performance enhancing drugs to tip the balance of warfighting effectiveness,
 - use bio-warfare agents of unprecedented lethality
 - forecast the health and behavior of our leadership by reading their genome.

Nations and their Interactions

The group itemized sources of conflict over the next 10 to twenty years as follows.

- Widespread local government instability fed by haves vs. have-nots, globalization, poor distribution of resources. And haves and have-nots.
- Aggrieved actors.
- Conflicts between “great powers” > China, Russia, Iran, India
 - Historical threat has been great powers – Germany, Japan, Soviet Union
 - Power struggles will continue – same world we’ve lived in.
 - Growth of potential great powers - China
- Increasing number of small non-state conflicts.
 - Civil war vs. non-state
 - Countries marshal coercive resources
- Violent conflict over ideas, not things.
 - Ideological war (Religious) vs. political
 - Ideologies now impact as collective threat to U.S. and others.
- Hard to define national security because of Diaspora politics.
- Rise of Islamic Super-state (Egypt, Iran, Saudi Arabia). > Unexpected rise of a “super-state whose interests divert from those of the U.S.
- Technology
 - Shortening decision time frames for response and intervention
 - Counter – technology is lengthening decision time - detection
 - Technology is progressing faster than social institutions
 - War by hair-trigger posture
 - Proliferation of politicians
- Major economic transformations
 - Difficult to predict who are going to be the players
 - Unforeseen tensions
 - Turbulent environment
- Direct threat: Aiming missiles at U.S.
- Indirect threat: population, demography, Ideologies
- Sustainability issues – other countries that don’t agree with usage of resources

These ideas were presented in a plenary session in which each breakout group reported from their session where questions and discussions were encouraged.



Participants listen to reports from breakout sessions



SESSION 2 BREAKOUTS

Small groups were formed again to begin discussions of problems from pairings of perspectives as shown in the chart below.

Session 2 Breakouts



Earth & its Resources + Technology & its Applications

- Undetected cyber attack
- Weather as a Weapon: Supercomputing + modeling = control weather (not in 20 years)
 - Malevolent weather terrorism (perfect storm)
 - Disrupt/enhance military operations or economies or resource loss
 - Multiple weather models—extend uncertainty and debate (regarding climate change?)
- Technical tools available to wider groups of users – expanding opportunities for either/both benevolent or malevolent use

Contamination of Food and Water Systems

- Nano- or bio- (e.g., virus) caused contamination
 - possible self-propagation, overcoming dilution limitations
 - normal water treatment breaks down
 - leads to greater scarcity of safe/clean water and/or food supplies
 - introduced through irrigation?
- Malevolent or accidental genetic contamination of food
- Food scarcity, sterility, toxicity
- Pollution-cleaning bacteria eats oil supplies (Kudzu effect on any high-value commodity)
- Major critical resource loss resulting from intentional and/or unintentional effects

More Kids – Less Kids

- Introduction of mind/emotion-altering drugs into water supply (e.g., as flows into another country)
 - desire for children ... resulting in increased population
 - antipathy for children ... resulting in decreased population

Results in:

- scarcity of workers sufficient to maintain economic growth
- drop in productivity
- inability to properly care for aged



A typical breakout session in the BMT.

People and their Institutions + Nations and their Interactions

- In some Islamic states or sub-national groups, American culture (as represented in American media) is viewed as a cultural abomination to be removed. Some wish to retaliate more directly.
- If people (leaders?) and institutions become discredited, then the divergence between the haves and have-nots creates a kind of void that may encourage looting and crime.
- Maybe some type of institution or idea needs to address the gaps between these two groups, for example in South America.
- If world institutions become ineffective, then that seems to encourage violence.

Ideology and Religion

Religion will persist regardless of national technological standing; but religious issues could affect economic and technologic progress

- Ideological fanaticism drives violence
- Ideology can also include nationalism
- Ethnicity is more the issue than religion

International Institutions

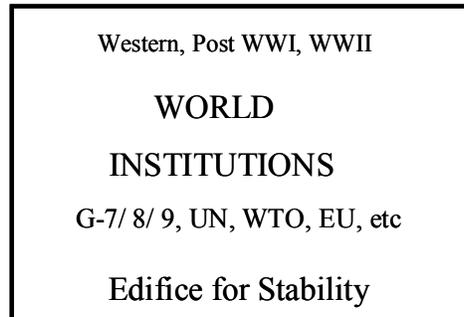
- There is a set of international institutions designed to promote social well being and resolve conflicts peacefully. If the legitimacy of these institutions declines too far, the international arena reverts to the “war of all against all” that Hobbes said required government. When institutions that try to act as mediators of competition become illegitimate then there’s nothing left but competition
- UN peacekeeping is an example of an international institution with a degree of legitimacy. But what happens if the UN becomes more active in negotiating peace in the Middle East?
- A nation state with an intolerant regime like Iran’s can contribute to destabilization of the system of international institutions.
- The prevailing set of international institutions was created by the Western powers, usually with US leadership, in the wake of WW II and thereafter. Will a “clash of civilizations” (a la Samuel Huntington) lead to the breakdown of these institutions?
- Some of the institutions have been successful, others failed: e.g. NATO vs. SEATO.
- The sovereign state has been the basic building block of these institutions, but sovereignty is becoming a less clear-cut concept.
 - For example, the US has indicated that sovereignty does not entitle a state to slaughter its own people.
 - And the US is learning that the traditional instruments of sovereign power, armed force and wealth, do not necessarily provide protection against such threats as environmental contamination or non-state actor terrorism.
 - “Failed” states also fall outside the “sovereignty” paradigm.
- The decolonization that took place after WW I, but especially after WW II, has also stressed the institutions established by the Western powers. The new states do not necessarily accept all the rules, or that the institutions equitably for them.
 - Ideological strains in the Middle East are at odds with the Western institutions international norms, but
 - No one from the Muslim community has created a counter-system
 - Some groups are not in the game; others may be in the game but they play by their own, ideologically derived rules
- The following diagram illustrates that forces undermining the current system of international institutions may come from two directions: nation states who feel the system is inequitable, or sub-national or trans-national groups attempting to attack or undermine support.

Session 2: Nations and People

Perception of preferential/
unfair
function of
institutions



“Gnawing
Forces”



People
organizing
around
opposing
views/
values/
ideologies



“Gnawing
Forces”

Potential Threats:

Gradual Erosion

Shock Wave

- It was pointed out that the system of institutions might in fact not be fair to some, and the question arises whether the institutions can adapt to a changing world, as opposed to continuing to be forced on the weaker and less influential states.

Technology and its Applications + People and their Institutions

Listing of Potential Problem Statements

- Cloning
 - Reproductive
 - Therapeutic
 - Super bugs/super devices
- International norms and governance (absence)
 - Ill intentions of people – better monitoring
 - Restrictions on publications (impact on science)
 - Cooperation of research
- Agricultural biotech: work goes to China/India
- Knowledge Wars
- Smart Tech
 - Emergence of smart technologies in order to undermine government
 - Direction uncertain
 - Convergence of different fields (tech and biological)
 - (i) Big country only game – how do we use?
 - (ii) Barriers to entry – how hard is it for a country (China) to be motivated to pioneer bio
 - Monitor electrical parts of brain (aggressions)

- Further human species –
 - Loss of cultural diversity
 - Need further authenticity in the globe
 - Sustainable technological society
- HIV impact
- Population explosion
 - Stop being own worse enemy
 - Technology for developing countries (appropriate)
- Technology can drive cultural change... Future technologies may be distributed to other countries (e.g., China for bio which might most benefit from a war to demonstrate enhance dominance).
 - Build wealth w/countries
 - National clusters of technology
 - PhD's not growing as in the past

Problem Statements Presented to Full Group

- The large scale application of any of the four major technology drivers (biology, information, nano-technology, or advanced weapons) would cause very large shocks in the impacted country, which could destabilize its governance, economy, and institutions. It could also create a very negative attitude towards that and other technologies. It is hoped that they would not further aggravate existing fault lines in inequality, culture, and law, although that cannot be excluded.
- Advances in life sciences will create or exacerbate fault lines in societies, in nations, and among nations that threaten national and global security:
 - Availability of health care and nutrition
 - Creating a privileged/non-privileged performance class
 - Life extension
 - Genetic discrimination for economic opportunity
- Margaret Mead statement: Excellence in one (or more) of the technologies (info, bio, nano, and wepo) drives the people factors (shocks, governance, culture, equity, economics, people, and health).
- Conversely, the people factors of a country (notably culture, economics, and shocks) and a deficit in international governance to level the playing field shape the potential of a country to excel in the competition for technological dominance.
 - US dominates in Info and Wepo.
 - Bio and Nano are up for grabs and represent the next major strategic competitive industries and war fighting capabilities. China and Europe will compete heavily. China's amoral approach may give it the edge.
- Is there synergism among the technologies so that one country has to be good in all to be dominant in one—hence are bio, nano, info, and wepo hegemony likely?

Nations and their Interactions + Earth and its Resources

Discussion centered on the topical fields of ideological conflicts and the growing influence of disparate groups coupled with the increased exploitation, and its resultant effects, of the Earth's natural resources (e.g., water as a weapon - the potential use of access to water as a channel of political influence, climate change) up to and including the genetic manipulation of its living resources. Additionally, with the increasingly interconnectedness of the global economy, combined

with relatively ubiquitous access to advanced technology, the disposition for surprise has greatly increased.



Typical session in the front of the gameroom.

Some Threats Listed

- Agricultural attack – destroy wheat
 - Starvation
 - New food sources
 - Economic impact
 - Leads to conflict
 - Internal
 - Between nations
- Water conflicts
 - Lack of water
 - Collapse of agriculture/fisheries
 - New water sources
 - Economic impact
 - Leads to competition/conflict
 - Internal
 - Between nations
- Global Climate change
 - Significant drought in US
 - Water diverted for drinking
 - Economic disruption in US
 - Realignment of wealth
 - Imports of grain from elsewhere

- US loses current level of influence – we are dictated to
- Increase precipitation in Mexico... ..becomes “bread basket” – have not(s) are now have
- Mexico/Canada refuse to provide water due to their shortages
- Mexico superpower – role reversal

Convergence of trends

- Growing influence of Diaspora groups on US + resource conflict = US involvement
- Ideology conflicts + resource conflicts = US involvement
- Water shortages + increased propensity for economic surprise = water as a weapon
- Emergence of new great industrial nations (India) + increased fossil fuel by developing countries = climate change
- Bio-engineering + unfriendly actors = limits exports, starvation, increased food prices

Once again, reports from the breakout sessions were given to all in the participants, allowing questions and discussion.



A typical presentation from breakout sessions.

SESSION 3 BREAKOUTS

Session 3 Breakouts



People and their Institutions + Nations and their Interactions + Technology and its Applications

The session discussion focused primarily on the emergence of grievances and conflicts among peoples and nations caused or exacerbated by major demographic divergences. When coupled with other economic, cultural, and ideological stresses, such grievances can result in threats to national and global security from disruptive and or destructive actions by individuals, groups, or nations in response to these conflicts. In a negative sense, technology has contributed to the emergence of demographic divergences and exacerbated stresses, while broader access to technology is helping enable the disruptive and destructive response behavior.

Demographic Divergences Lead to Grievances Among People and Nations

- Aging population, particularly in developed world, led by advances in medicine and access to health care that provide means for birth control and greater longevity
- Youth bulge, particularly in developing countries, due to decline in childhood death rates combined with relatively high birth rates

Grievance issues and conflicts, exacerbated by socio-economics, political, ideological factors

- Stressed economies / insecurity / perceived disenfranchisement &/or exploitation
- Haves (wealthy) vs. have-nots (poor)
- Unemployment (youth)
- Pro-modernity vs. anti-modernity (religious/cultural conflict)

- Pension & health crises (aging)
- Threat – depression and economic and financial meltdown: economic impacts from self-reinforcing effects of ensuing crises

Technology enables disruption of globalization by disaffected groups

- With feedback to economic crises
- Threats to globalization (trade, investment, Western commercial culture)
- Slow commerce in all nations

Driver Issues

- Youth bulge, largely in under-developed countries
- Charismatic ideologically-driven leader(s)
- Youth dislike of the US as economic hegemon (America, go home and take us with you!)
- Clashing ideologies (spark) e.g. anti-globalization interest groups
- Unemployed youth—create regional or global movement (new Mafia?)
- Stressed economy
- Situations/grievances (age/youth, haves/have-nots, pro-modernity/anti-modernity, etc.)
- Technology allows shadow groups to stay invisible (al Qaeda in 2002)
- Perception of technological inequities (e.g. “technology” = “modernity”)
- Techno-literate youth movement use technology to redress grievances, communicate globally (translation software)

General Listing of Threats

- Fragmented education system contributes to fragmented society
- Religious/political (?) differences
- Fanatical individuals ... willing to die/kill
- Access to technology that can be used for destructive purposes (e.g. MS flight simulator)
- Demonstration of threat credibility and target vulnerability with 9/11 attack
- Older population, fewer young
 - Slower economic growth
 - Have & have-not nations, ... partly determined by age of population
 - Longevity accelerates, affects:
 - Pensions
 - Healthcare
 - Promotes global grievances related to age
 - Destruction/melt down of Welfare states (e.g. Argentina, Germany in 1932)
 - Young activated to non-democratic forms of government
- Supra-national entities, e.g.
 - multi-national crime syndicates
 - terror networks

- Internet communications enable more effective spread of
 - Disinformation
 - Disruptive expectations
 - Malevolent intentions and actions
 - Limited ability to absorb changes, cultural infusions
 - National overreaction, e.g. WoT policing, privacy, obsessive rumination that shares, foments, and exacerbates situation more than is prudent
 - Common enemies join
 - Spread changes rapidly
 - Cause change (e.g. financial innovations, derivatives, int'l \$ vehicles)
- Misery on every level
 - physical infrastructure
 - personal
 - institutional
 - societal
 - national
- Stability of system is hostage to smaller groups of people
- Significant distrust of, or ambivalence to, national and global institutions
- Desire for isolationism, further enabled by technology:
 - stand-off weapons
 - missile defense systems
 - military power sufficient to operate unilaterally
- Extreme events/consequences/concerns
 - Attack Iraq
 - WW III (?)
 - Regional nuclear exchanges



Typical session in Gerry's Office

Earth and its Resources + People and their Institutions + Nations and their Interactions

International Institutions

- The framework developed in Session 2, "People...Nations" (see diagram in that notes section) was introduced, but not ultimately used in this session.
- The question was raised whether "stability" was a desirable goal for the system of international institutions, as stability could prolong inequities and injustices.
- The alternative goal of "peaceful means of settling international conflicts" was suggested.

Resources

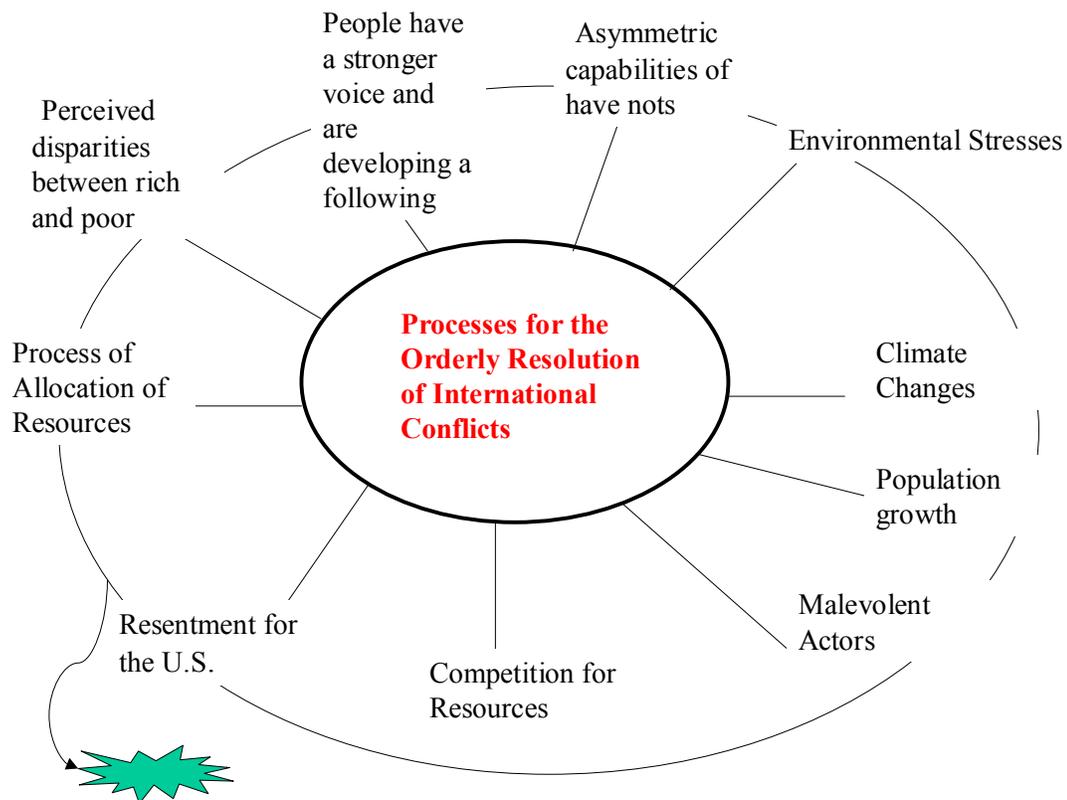
- Intellectual capital, at least for some (e.g. Japan) may be more valuable than earth resources.
- The reason our economy does so well is that our workers are willing to move and to change
- But having the intellectual capital makes the resource valuable
- Intellectual capital is more difficult to steal than resources
- Saudi Arabia and China don't seem to create much intellectual capital?

Demographics

- Population growth drives resource competition
- We assume that we can just grab resources, or that we trade for it of equal or greater value, but others may not accept this approach. There is a growing disparity between the world's wealthy and impoverished: this could undermine international institutions.

Energy

- There was considerable discussion of the recent California energy crisis, which emerged from a confluence of regulatory changes with unforeseen consequences, a changed mode of distributing electric power across state borders, unusually high temperatures and drought, and price and supply manipulation by brokers.
- Possibility raised that there might be analogies at the international level.
- The following diagram was presented as a summary of the discussion:



Nations and their Interactions + Earth and its Resources + Technology and its Applications

The sub-group presented to the whole group a set of “problem statements” as follows.

Bioattack on U.S.

- Bioengineered pathogens are distributed widely within multiple municipal water supply systems throughout the U.S. by agents acting on orders from state actors (e.g., Saddam Hussein or Kim Il Jung) or non-state actors (Al Qaeda). In addition, agents infiltrate a different set of pathogens into food stocks directly at the source of generation (i.e., laboratories where seeds are generated). This would result in widespread and long-lasting effects, such as a mass dehydration and mass starvation.

Porous borders and ports lead to possible attacks and provide entrée for weapons

- Maritime Scenario:
 - Attack on ports. Hundreds of ships with dangerous cargos enter our nations ports each week. Example is the LNG tankers that use the port of New Orleans. These cargos can be used as weapons.
 - Shipment of weapons and harmful material through ship-born containers. Thousands of containers transit our ports each day and are almost immediately transported throughout the nation via rail or trucking. Only about 1% is effectively inspected.
- Insecure Border Scenario: Transport across our borders is poorly inspected, e.g. rail cars and trucking.

Attack on IT Infrastructure that would specifically disable critical systems, causing severe ecological damage, such as:

- Power grid/dams
- Municipal sewage systems
- Nuclear power plants
- Chemical plants

Covert War protects the aggressor from US retaliation

- China uses wind driven dust from China currently assaulting the US to transport a fungicide resistant version of the ricatonia fungus to attack our corn and wheat crops and then shut off the source. By the time the fungus has devastated the US food supply, there is no trace of the source and it looks like a natural evolution of the existing fungus. China takes advantage of the US domestic crisis to annex Taiwan.
- Validation of effect: Currently the soil fungus from the Sahara is being transported by high-altitude winds and is devastating the corals of the Caribbean

Environmental connections tie us to other's agendas

- China's Energy Plan calls for the construction of 100 Gigawatts of high-sulfur coal-burning power plants without scrubbers. The resulting pollution will cover the northern hemisphere. Sovereignty of nations precludes forcing China to clean up their plants so we pay for the impact on us or China uses it as a bargaining chip for some concession or aid.
- Nuclear War between India and Pakistan or Israel and Iraq cause fallout that spreads broadly—causing some health effects and much fear and loss of confidence in the future with adverse economic impact.

Technology and its Applications + People and their Institutions + Earth and its Resources

There was considerable discussion of the malevolent use of and/or unintended consequence of genetic manipulation. Much of the discussion was related to topics discussed in FG Breakout session-2 (water shortages, climate change, etc).



Typical report from breakout session

Biotechnology/Environmental Threats

- Lack understanding of genetic expression (gene to proteins) leads to devastation of crops and/or disruption of endocrine system in humans resulting in chronic diseases. Agriculture collapse due to genetic manipulation + Economic stresses due to aging population + Economic and political implications of Global Warming = ?
- Genetic engineering + Global Climate Change = Big Trouble
- Designer virus + greed or racism = genocide Enhanced tech + consumption = global warming
- Global Climate Change + Need for food + Genetic engineering = unintended consequences

Water

- Limited Water=influence by those who have it
- Limited water + climate change = mass migrations
- Limited water + malevolent/desperate/selfish actors =?
- Existing technology + increased consumption + poor resource management = ?

- Change US policy from wasteful agricultural use to conservative residential use

Various Technologies

- Flight simulators + radical fundamentalism = WTC
- Lack of movement in tech + big increase in people + consumption of natural resource = overall environmental degradation
- Time to develop technology + unintended consequences + nonlinear Gaia response = too late
- Democratization of technology + exploit + depleted resources = lack of revenue
- Cyber-threats
- Focus on short term + inadequate tech development + asteroid = roaches
- Fishing tech + greed + depleted resources = no fish
- Political/Military vulnerability due to increasing contracting out of critical industry
- Globalization and democratization of technology

Economic globalization results in

- Exploitation of disenfranchised populations
- Complex interdependencies
- Communications make inequalities more visible, enables threats
- Lack of technology = economic frustration

Population growth

- Use of conventional technology + population growth and economic development + limited resources ≠ global sustainability
- Atmospheric emissions
- Cities more populated and less desirable
- US getting cleaner and importing the things that result in pollution
- Desperate blackmail threats
- Foreign dependence on electricity
- Environmental threats
- Increasing interdependent relationships

FINAL PROBLEM TOPIC SUGGESTIONS BY “THINK TANK” VISITORS

With the workshop discussions as background, the think tank visitors were each asked to write one final proposed topic for discussion on the big white board.



Think Tank Visitors pose a final list of problems

The following is the list of topics generated during this session.

1.

Demographics Problems

Have's vs. Have not's

Eugenics (social competition and disruption)

Pervasive Effects of Biotechnology

Uncontrolled replications (sustainability)

“Deadly Pathogens”
- Agriculture
- People

Dangerous Macro organisms?

Huge solution spaces
2. American and European “Winner Take All” behavior with profound Western wealth and technological competency—monopolized by very small percentage of global population will prompt explosive innovation in ideological and broad asymmetric and peer threats to American and European dominance. Broad instability and global confusion will ensue.

3. Post WMD Reconstruction USA survival strategies. What preparations are required now to ensure US survival of successful – single or multiple WMD strikes (survival of, for example – governance, medical care, economic activities) national unity? i.e., dispersed, redundant, off-line systems; prepare citizens goal to reduce destructive terror response; fully engage private sector entities, who control/own critical infrastructure.
4. Rampant proliferation of arsenals that privilege first strike (info, space, missilery, WMD). Any usage – given first strike advantages – risks systemic spillover/chain reaction → antagonist, neighbors, extra-regional patrons, unrelated score settling, etc. How does S&T build and institute a Crisis Response/Reassurance System (surveillance, communications, warning, confidence building) to interrupt/break this dynamic?
5. How to, practically speaking, reverse the growing trend towards fundamentalism extremism in many Arab countries.
6. If non-state actors and poor state actors who wishes harm can be expected to use likely COTS technologies against us, i.e.:
 - a. Virulent “designer germs”
 - b. Nano attack robotics
 - c. Agri-bio agents,

Then we need to develop counters:

- a. enhanced immune system technologies
 - b. nano robotic detectors and interceptors
 - c. anti-bio sprays for agriculture that anticipate the worst the bad guys can do.
7. Lack of consideration of US role in generating its own national security threats. What does the US do to (and what will it do) to legitimately antagonize allies and adversaries?
 8. Economic and national security increasingly are one and the same. That is, we need to define national security by what it is we are practicing: our prosperity and sense of well being. While many physical threats are speculative (i.e., we aren’t positive of a smallpox attack) the stresses posed by population trends are certain. We need to better understand these tectonic trends in the context of national security rather than merely as compartmentalized social crises – a process in which Sandia can play a key role.
 9. The U.S. superpower capabilities focus on military capabilities, which must be re-aligned to match more likely economic, population, and ideological threats.
 - National security is more than military capability
 - National security decisions must be informed by through cultural intelligence
 There are many more threats than government agencies can deal with → increase Think Tank funding.
 10. The U.S. utility grid is vulnerable to disruption. Can new technologies – wireless communications, generators, batteries, etc. – serve at the basis of a less vulnerable infrastructure?
 11. “No end to the damage that can be done.” Threats include anything and everything – but we can’t harden every target. See “Wasp” by Eric Frank Russell (1956). Immigration > preparation. Attitudes get first pick. So focus on the source, which is people. Use medical/hygiene metaphor at intruder ID’ing. Need to normalize “IFF” into civil life. Be

sensitive to civil liberties resources, but persuade U.S. public that British style cameras, ID cards, etc. are needed.

12. Major climate change as “The Mother of all Market Failures.”
 - a. Not an administrators for political agenda
 - b. Great uncertainty but presumably huge downside risk
 - c. International institutions including the market, not structured to deal with it or its fallout
 - d. How serious the threat of de-legitimization of institutions—“rules of the game,” etc.

Each participant was then allowed to vote (by writing their name beside the topic) on which one of these topics they wanted to explore in the final session. Since issues 2 and 12 received the most votes, these were discussed in a final plenary session in which these questions were explored:

- What would be some first steps that would need to be taken to tackle this problem?
- Who else would need to be involved in order to make progress?
- What related issues would need to be considered?
- Who in this workshop had an interest in pursuing this topic further?



The final discussion session

These are the notes from that final session:

1. Major climate change as “The Mother of all Market Failures.”

- Not on the administration’s political agenda
- Great uncertainty but presumably huge downside risk
- International institutions including the market, not structured to deal with it or its fallout
- How serious the threat of de-legitimization of institutions—“rules of the game,” etc

First Steps:

- That is not just a crowded field but is a delusional field! What kind of answer could you get that would be useful?
- Get beyond the problem statement and the current rhetoric/debate to understand whether or not there is something going on.
- The key part is environment or climate change. An enormous amount of money will be required to correct these problems.
- Great deal of activity going on in Europe and elsewhere looking at government functions to create new benchmarks of activity. Look at government things going on outside of our Government.
- We have some unique capabilities i.e. modeling simulation super computers, and we could model these problems better with these technologies.
- It’s not on the foreign policy agenda but is on the current administrations agenda to do something about this field.
- You might assume that this is happening –reality. Start quantifying potential effects.
- Have to look at what’s in place. Investing \$20M in clean coal – how does that fit into international approaches?
- There’s room for new scientific approaches to dealing with a nonlinear system. It’s conceivable that this has nothing to do with Co2 but with other natural factors. The whole science might be wrong. Once you put policy and economics on phony science things can go haywire.
- Cast problem as a Nash Equilibrium problem and generate options that benefit all
- This looks like an international approach and take everyone’s approach such as what they have to play according to their pocket book. TAKE A NASH EQUILIBRIUM APPROACH -- no one can move ahead to advance their approach-- what type of technology can we propose to change this equilibrium?
- What happens if violent weather is a reality?

Who else would need to be involved in order to make progress?

- Other nations accepting this as a reality. Coalition of countries? In this field it is a mistake to think of it at a national level. Identify pockets of innovative thoughts...
- IPCC (Intergovernmental Panel on Climate Change) has done a lot of work over the years on this.
- OACG working group

- Engage people competent in modeling complex modeling in your systems. Engage expert in complex systems and complex modeling. – LANL, NOAA, SFI, Princeton’s Geophysical Dynamics Lab, NCAR...
- Engage some of the large companies like BP.
- Institutions that look at risk assessment, i.e. insurance industry
- U of Oklahoma has gathered a lot of data – impact on agri production, water supplies, and droughts...
- US S&T policy community
- Universities in other countries that look at these problems from their nations perspective
- Need to interact more with the traditional avenues that interact with this
- SNL S&T council

What related issues would need to be considered?

- Trade winds as a transport would fit into this.
- The impact if weather patterns change and agricultural productivity changes, will have impact on food supply, water, things associated with weather – droughts
- Question: More linkages to national security and global security in this regard, and if so how?
- Question: Is there a connection between global climate change and terrorism in general?

Who in this workshop had an interest in pursuing this topic further?

- SNL: Dave Borns, ACG but may not commit funds
- New America
- CIA - may not commit funds
- Potomac Institute

2. American and European “Winner Take All” Behavior

Profound Western wealth and technological competency—monopolized by very small percentage of global population—will prompt explosive innovation in ideological and broad asymmetric and peer threats to American and European dominance. Broad instability and global confusion will ensue.

First Steps:

- Build a model where:
 - People are users, produce, threaten, and you have resources that might be economic, financial, and you have shocks in this system.
 - Ability to change and change quickly.
 - The key is to help build a way of understanding.
 - Look for discontinuities.
- Model concerns
 - Can it be done?
 - What do you want out of it?
 - What will this do to sovereignty?
 - Perspective of bad guy using as a targeting tool

- Models of human behavior different than modeling the weather; it is so complex it might not be able to be done; have to have a clear understanding.
- If you think of modeling the relationships on output and qualitative input would make the market more effective and just identify where opportunities might be... does require smart people to ID and establish the relationship.... Gaming is useful ... keep inputs relatively simple and to see if the effects make sense to produce actions
- Pick one piece – economics – very tough (economists have worked on this like Rahme)
- Technology investment
 - public funding of research and innovation
 - private sector – various kinds of incentives to engage private sector in research and development, particularly agriculture and health.
- Models may not be that complicated - World Bank built one of these. But after you're done with the model you're left with a so what?
- Have a global of economic summit?
 - 40-50 of top creative economists.
 - Create an alternative vision out there other than a security collaboration.
 - You need a semi-private /semi governmental exercise
 - Maybe a “war- gaming”? “prosperity game”?
- It might not be a bad idea to inventory what's already going on:
 - there are NGO's that are working on the side of asymmetrical threats
 - It seems like just getting a handle on the facts in a real time way would be helpful to shrink that event horizon to where you see the building trends early understand this before you start to track and model it
 - Need to understand what the nations of the world really - ask US? Ask Europe? Ask Japan and China?
- There are no end of groups of people that are trying to get together on the policy issues problem statement 5 keeps me awake at night and Arab fundamentalism is going to bury us... in terms of a real threat... most of the people that study Islam say the trend is in the opposite direction and there may be other factors that we are unaware of we don't need to confuse what happens in Saudi Arabia – a family run empire. Revolution isn't necessarily a fundamentalist revolution.
- #9 is a way to focus efforts on #2
- Be careful of “fad” issues
- Develop indices to show where factors correlate – then track
- Past case studies – look at some of the successes, for example South Africa, or other case studies where interaction between developed countries and explosive situations had positive outcomes.

Who in this workshop had an interest in pursuing this topic further?

- CSIS – Anne and Paul
- New America Foundation - Steve
- Sandia National Laboratories – ACG

APPENDIX A. LIST OF ATTENDEES

Affiliation	Attendee
CIA	Bill Anderson
CIA	Nancy Forbes
CIA	Paul Herman
CIA	Diana Turecek
CSIS	Anne Solomon
CSIS	Paul Hewitt
New America Foundation	Steve Clemons
New America Foundation	Jim Pinkerton
New America Foundation	Mike Lind
Potomac Institute	Gary Anderson
Potomac Institute	Charles Hammon
Potomac Institute	James Richardson
LANL	Greg Canavan
DOE-AL	Dan Krivitzky
Sandia	Gerry Yonas
Sandia	Judy Moore
Sandia	Jessica Turnley
Sandia	John Whitley
Sandia	Tom Karas
Sandia	Nancy Hayden
Sandia	Ben Wu
Sandia	Rick Craft
Sandia	Ken Miller
Sandia	Jim Gosler
Sandia	Tim Moy
Sandia	Ron Pate
Sandia	Gary Jones
Sandia	Bob Floran
Sandia	David Borns
Sandia	Mark Grubelich
Sandia	Pace Vandevender
Sandia	Darryl Drayer
Sandia	Ron Stoltz
Sandia	John Guth
Sandia	Peter Merkle
Sandia - Facilitator	Chris Madigan
Sandia - Facilitator	Georgianne Smith
LTD - Facilitator	Linda Logan Condon
Sandia - Facilitator	Mary Nation
Sandia - Note Taker	Jason Libersky
Sandia - Note Taker	Gabriella Hernandez
Sandia - Note Taker	Pat Scharnberg
Sandia - Note Taker	Lori Carroll

APPENDIX B: AGENDA

Tuesday, August 6

Time	Item	Place
8:00	Continental Breakfast	Gameroom
8:15	Welcome	
8:30	Introductions	Gameroom
9:15	Setting the national security context	Gameroom
9:30	Generating the starting list of problems	Big White Board
10:15	Understanding this starting point	Gameroom
11:00	BREAK	
11:15	Synergy Session 1: Exploring single perspective problems	Breakout areas
12:15	Pickup LUNCH	Library
12:30	Reports from Session 1	Gameroom
1:30	Synergy Session 2: Combining 2 perspectives	Breakout areas
2:30	BREAK	
2:45	Reports from Session 2	Gameroom
3:45	Synergy Session 3: Combine 3 perspectives	Breakout areas
4:45	Dinner instructions	Gameroom

Wednesday, August 7

8:00	Continental Breakfast	Gameroom
8:30	Adding Second Thoughts	Breakout areas
9:00	Reports from Session 3	Gameroom
10:20	Centers of energy	Gameroom
10:30	BREAK	
10:45	Exploring next steps for high-energy problems	Gameroom
11:45	Pickup LUNCH	Library
12:00	Thanks & lunch	Gameroom
1:00	Adjourn	

APPENDIX C: THE PROBLEM LISTS GENERATED AT THE BIG WHITE BOARD

Earth and Its Resources

Climate Change

1. Need to slow greenhouse gas emissions imposed by global warming will end the era of cheap fossil fuels.
 - This will result in complex interactions with the economy and entire energy and transportation sectors
2. Rapid climate change leading to water or food resource problems (e.g., global warming causes collapse of Gulf stream, freezing Europe)
3. Climate change
 - Small amounts of warming interrupt ocean currents with major impacts on weather
 - Change increases the worldwide misery index, leading to wars and mass migration
 - Question of how you intervene in the atmosphere on a large scale to alter its composition (adding and filtering certain constituents)
4. Sudden nonlinear regional climate change

Energy

5. Need for other (non-petroleum) cheap fuels
6. We need a robust mix of fuels to avoid dependence
7. Energy decisions made now will have impact on interconnected system 10 to 20 years from now
 - Intersection and displacement issues, e.g., energy and water
 - Supply is there – but is the infrastructure there?
 - Resiliency: could the US absorb the loss of the Alaskan pipeline, loss of Venezuelan oil exports?
8. Religious wars (or, or in addition to, depletion) will end the era of cheap oil in ~20 years
9. Agenda- driven misinformation re: energy supplies (i.e., fossil fuel reserves are actually unlikely to run out for the foreseeable future).
10. Dependence on foreign oil by the US and its allies. Radioactive release (from thermo-nuclear weapons, radiological weapons, or power plant attack or accident)
 - Consider also wasted repositories and management
 - Need more accurate health effects understanding

Population, Environment, and Resources

11. Accommodating and understanding population growth drivers, indicators, and demographics: economics, resources, etc.
12. Global competition for resources
 - China, as a net user of resources for its billion-plus population
 - Russia, as a holder of vast, unexploited resources, which provides it with great market leverage
 - Decreasing fossil fuel supplies will drive up prices making west more vulnerable to political and market change
 - India (approaching one billion population)
13. Environmental sustainability

14. Global food security: \global population of 8 billion by 2025 – need to expand food supply without expanding use of current, e.g. land and water (agricultural biotech may be one answer)
15. Water (shortages, impurity) Man-made ecological disaster such as led to the fall of Central American civilizations

Other

16. Earth collision with a large celestial body
17. Complex interdependencies of non-linearities of energy, water, agriculture, and national and global economies
18. Disruption of agriculture by terrorism or nature

People and their Institutions

Economics

1. Economic sources of instability
 - Collapse of Chinese economy—and state?
2. Increasing GDP and income inequality—
 - Economic marginalization of countries
 - Inability to support democratization
 - Generation of internal unrest
3. Poor, antiquated governance of international economic system
 - or evolution in unfortunate directions—disruptions, breakdown, illiberalism (i.e. anti-free-trade policies)
4. “Lights-off” (automated) manufacturing will eliminate most jobs
5. Spread of drug-resistant diseases or tailored pathogens
 - management of new/ emergent diseases
 - makes us more vulnerable to biowar drives up health costs
 - Emergence of extreme nationalism (closing borders?)
6. Loss of confidence in fundamental economic institutions
7. And many social, political, and academic institutions in general—white male Anglo-Saxon power base still dominant; encourage others (women, blacks) add their voices and views to the decision making process.
8. Japan defaults on debts and drags EU down with it

Demographics

9. Migrations that result in fundamental social or governance changes in the receiving nations
 - Social institutions designed for outdated demographic profiles (i.e. age, ethnicity, language)
10. Immigration—loss of single political culture; political leaders manipulation of myths/symbols to rally common cause increasingly fail
11. Infanticide in China and India resulting in aborted female fetuses, producing a population with excess young males who are uneducated, unemployed, and will never marry
12. Economic decline driven by global aging
 - Aging in developed countries versus developing world
13. Lack of soldiers and martial values in aging, low-fertility nations

Religion

14. Fundamentalism—Christian, Islamic, Jewish etc. (i.e. intolerance)
15. Rise of Christian militants in 3rd world
16. Use of religion to further national goals
17. Suppression of distinctive religious beliefs due to perceived danger to society Transition to new social contract
 - Obsolescence of institutions and inability to adapt rapidly enough to avert crisis
 - Spread of democracy
 - Change in U.S. society from manufacturing to service oriented economy

Other

18. Haves versus have-nots, techno-savvy vs. techno-illiterates, and restrictive role of women in patriarchal societies
 - Issue- when the have-nots realize that they *are* have-nots—class warfare occurs
19. Highly sympathetic robots, e.g. Honda's "Asims," are programmed to act like ourselves, while others—especially foreign nations—are seen to have less and less redeeming value
20. New science (e.g., anti-matter) is increasingly counter-intuitive: less comprehensibility makes it hard for legislatures to govern sensibly
21. Death of minority rights, personal liberties in face of nationalism for "national security"
22. Balkanization or tribalism (undermines nation states)
23. NEOCRIME syndicates
24. Transnational crime
 - Influence on global economies, power, military, capabilities, and support of regimes for corrupt "nation building" drugs etc.
25. Technology advances fundamentally change education institutions (e.g., distance learning removes socialization functions from schools)
26. Telecommuting has changed the nature of work and undermined the unity of the business workers
27. Push to get WHO global minimal health package funded and implemented

Technology and Its Applications

Biotechnology

1. Human genetics research and technology diffusion
2. Tailored pathogens – creating viruses from scratch – targeting individuals or ethnic groups
3. Spread of dangerous macro-organisms
4. Comment → need modeling capabilities to provide quantitative and qualitative information for policy makers, for example, about the spread of infectious disease → need capability to quantify uncertainty
5. Life Sciences Frontiers: Knowledge of living systems and capability to alter living systems
 - a. Future global ubiquity of biotechnology knowledge and know-how
6. Use of genetic engineering as a WMD – including unauthorized hacking of human genome by individuals
7. Agricultural security and food safety

- a. Introduction of pathogens livestock, crops
 - b. Vulnerabilities due to concentration
 - c. Economic vulnerabilities
8. Monoclonal practices (?)

Biomedical Engineering

- 9. Wet-ware/hardware interfaces for enhanced human performance
- 10. Super-human capabilities for the very rich but not for the masses
 - Combining info, nano, bio, cogno to create “super soldiers” or an elite class
- 11. Rampant spread and extension of longevity

Information Technology

- 12. Perfect and pervasive encryption
- 13. Ubiquitous secrecy
- 14. The end of secrets as cyber security fails completely
- 15. Ability to break any encryption
- 16. Impact of information technology on human rights (pros and cons)
- 17. Increasing tension between applications of technology and civil liberties Big “brother-in-law”
 - security class privilege
 - possible rxh (?)
- 18. Changes in privacy, availability of personal information, identity theft
- 19. Use of intelligent agents in next generation net used as soldiers in terrorist nets and US stand off weapons that target intelligent operations
- 20. Supercomputing and simulation are so cheap that non-state adversaries can “model” their attacks

Education and Knowledge

- 21. Shortage of American scientists
 - a. Declining enrollment in scientific disciplines
 - b. Scientific and technical illiteracy in the public
 - c. US lacks a national goal, e.g. Apollo
 - d. Forces reliance on imported scientist
 - e. Makes US less competitive globally
- 22. Work from early ages to teach (and excite) more women and minorities into science, engineering and math and keep them there
- 23. Problem of technical elites vs. the technically unaware
 - in society
 - in government“
- 24. Knowledge Wars” —Scientific technology knowledge key to economic/military power—ways to protect and control will increase: IPR (intellectual property rights) protection, national security-imposed controls, export controls
 - Question: Will nations go to war over knowledge resources?

Other

- 25. Self-replicative nanotechnology as a weapon?
- 26. Weapons are no longer point source (e.g. silos, pill boxer, etc.); weapon components are placed in a variety of countries—including the US—to be mated, self-assembled when needed.

27. Viable non-fossil energy source obviates need for oil as energy source
28. Colonization of other worlds
29. PyrE (per Alfred Bester's *The Stars My Destination*)—the upward curve of per-person destructive power (hence, the “PyrE Curve”)

Nations and their Interactions

Great Power Interactions

1. Expansion of China will cause constant wars in Asia, culminating in major war with US.
2. China as a technical superpower (has world-class R&D; manufacturing capabilities in some sectors)
3. China as lender of last resort, becoming the major source of global savings. Rise of Islamic Super-state (Egypt, Iran, Saudi Arabia): unexpected rise of a “super-state whose interests diverge from those of the US
4. India and Pakistan have a nuclear exchange.
5. Breakdown in dynamics deterrence in highly proliferated world; actual nuclear exchanges
6. Violent conflict over ideas, not things; exacerbated by limited exposure and discussion of competing ideas
7. Number and identity of great powers (threats?)
8. “Countervailing coalition” against US – for what, why, how effective?
9. Deteriorating allies (historic allies no longer supportive) result in stresses to U.S. leadership

Domestic Instabilities and Nation-Building

10. Widespread local government instability fed by conflicts between haves vs. have-nots, globalization, and poor distribution of resources
11. Unemployment in the third world and the intersection with global economic trends; implies reducing gap between first and third world to improve security
12. Religious cataclysm in the Middle East may not abate; if it is accentuated, and outside powers dismember the area, how do you approach reconstruction for an entire region?
13. (Stable) nation-building by the U.S. and its allies (need for effective governance to promote economic development, rule-of-law, free press, etc.)

Other

14. “Israelization” of the US: Influence of large constituencies (nations, corporations, etc) on policy.
15. “Japanization” of the U.S. Economy: 10 years of economic stagnation.
16. Increase in power and influence of non-state actors and our lack of political mechanisms to deal with them
17. Globalization leading to complex interdependencies and unexpected vulnerabilities
18. Growth of WMD Terrorism
19. WMD used by parties with “Nothing to lose” WMD; eco-sabotage

APPENDIX D: MODIFIED LIST AND INTERDEPENDENCY MAPPING OF EARTH AND ITS RESOURCES RELATED PROBLEMS AND ISSUES

Interdependency is indicated by the associated numbers that refer to the original list of issues compiled in Appendix-2 (which is numbered and organized differently than the list provided near the beginning of this report.)

- Distribution (also, supply/existence/availability) of critical resources: 11
 - water 13
 - food 16 21
 - strategic minerals
 - energy 3 4 8 9 17 20

Moreover, inadequate supply or availability/distribution of water, food, strategic minerals, and energy can lead to:

- Potential conflict, even war
- Suffering
- Adverse impact on economy
- Global warming will end the era of cheap fossil fuels
- Complex interaction with economy and entire energy and transportation sectors
- Ideological conflicts/wars and/or depletion will end the era of cheap oil in ~20 years
- We need other cheap fuels (broader portfolio of energy supplies)... we need a robust mix of fuels to avoid excessive dependence on vulnerable sources
- Consumption (demand) of critical resources is tied to:
 - population 7 11 19
 - level of economic development
 - complex interdependencies 1 2 3 4 10 12 14 15
 - disasters (large individual events) 5 6 13
 - long-lasting / long-term effects, e.g. global climate change 18
 - other environmental impacts (pollution, resource depletion, etc.)
- Radioactive release (thermo-nuclear weapons, radiological weapons, power plant), repositories, waste management... more accurate health effects understanding
- Environmental sustainability
- Global warming/climate change will end the era of cheap fossil fuels
- Complex interaction of entire energy and transportation sectors with the economy
- Complex interaction of economic development (national, global) with critical resource demand/supply/consumption/cost 11

APPENDIX E: ORIGINAL LIST OF ISSUES FROM FULL GROUP RELATED TO THE EARTH AND ITS RESOURCES

1. Radioactive release (thermo-nuclear weapons, radiological weapons, power plants)
 - a. Repositories, waste management
 - b. More accurate health effects understanding
 - c. Proliferation of nuclear weapons and materials
2. Environmental sustainability
3. Global warming impacts could end the era of cheap fossil fuels
 - a. complex interaction with economy and entire energy and transportation sectors
4. Religion wars (and/or) depletion will end the era of cheap oil in ~20 years
5. Man-made ecological disaster such as led to the fall of Central American civilizations
6. Collision with a large celestial body – neo collision risk
7. Accommodating and understanding population growth drivers/indicators: econ., resources, etc.
8. We need other cheap fuels
9. We need a robust mix of fuels to avoid dependence
10. Rapid climate change leading to water/food resource problems (global warming causes collapse of Gulf stream freezing Europe)
11. Global competition for resources
 - a. China, as a net user of resources for >1B population
 - b. Russia, as a holder of vast, unexploited resources, which provides it with great market leverage
 - c. Decreasing fossil fuel supplies will drive up prices making west more vulnerable to political and market change
 - d. India (approaching 1-B population)
12. Climate change
 - a. Small amounts of warming interrupt ocean currents with major impacts on weather
 - b. Increase the world wide misery index, leading to wars and mass migration
 - c. How do you intervene in the atmosphere on a large scale to alter its composition (adding and filtering certain constituents)
13. Water
14. Energy decisions made now will have impact on interconnected system 10 to 20 years from now
 - a. Intersection and displacement issues, e.g., energy and water
 - b. Supply is there – but is the infrastructure there?
 - c. Resiliency: could the US absorb the loss of the Alaskan pipeline, loss of Venezuelan oil exports?
15. Complex interdependencies of non-linearities of energy/water/agriculture and national/global economies
16. Disruption of agriculture by terrorism or nature
17. Dependence on foreign oil by the US and its allies
18. Sudden nonlinear regional climate change
19. Accommodating vs. understand population growth drivers/indicators and demographics, economics/resources/etc.
20. Agenda-driven misinformation re: energy supplies
21. Global food security: In anticipation of a potential global population of ~8-billion by 2025 – need to expand food supply within the practical limits of available agricultural land and water resources. Broader application of biotechnology advances in the agricultural sector is one potential answer.

ThinkFest: Exploring Future National and Global Security Issues



Earth and its Resources



Nations and their Interactions



Technology and its Applications



People and their Institutions