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**Seizing the Moment: Harnessing the
Information Technologies**

Steve Bankes, Carl Builder

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A RAND NOTE

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Seizing the Moment: Harnessing the Information Technologies

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PREFACE

Recent political events, in particular the historic international political changes of 1989-1991, suggest that modern information systems and capabilities—as manifested in television, videocameras, facsimile machines, and satellite links—have been major factors in what many take as positive changes in the world. Could they be made even more effective instruments for peace if they were deliberately exploited through institutions specifically designed for that purpose? In the summer of 1990, a RAND-sponsored research project entitled “Transnational Institutions to Promote International Peace” (INFOPAX) considered this question and its ramifications. This Note describes the trends that motivate the question, identifies a rich landscape of plausible initiatives that institutions might reasonably undertake in hopes of making a positive difference, and suggests needed research. The INFOPAX study was a preliminary survey, and the final answer to this question remains unknown. However, the insights documented here suggest that the future may hold both significant opportunities and novel dangers. Thus, this Note should be of interest to anyone interested in the effect of information upon society and in the feasibility of transnational institutions intended to exploit the power of modern information systems and capabilities for the avoidance and suppression of international conflicts.

SUMMARY

The international political events of the past several years have been stunning. Most of them have been seen as highly favorable developments in their prospects for more open societies, for human rights, and, hence, for a more peaceful world. They have come in a succession of deliberate steps—the winding down of the Afghan, Gulf, Angolan, and Nicaraguan wars—and in a flood of revolutionary actions during 1989-1991, with challenges to the authoritarian government in China, the democratization of Eastern Europe, the fall of the Berlin Wall and the reunification of Germany, the breakup of the Soviet Union, and the end of the Cold War. Not all have been greeted with enthusiasm everywhere; the repression of the students in Tiananmen Square, the failure of the Russian economy, and the reunification of Germany have raised apprehensions in parts of the watching world. But, in the main, the widespread attempts at democratization are seen as a positive new direction, as an emergence from the dark shadow of war between east and west, and as an opportunity to attend to long-deferred economic, social, and environmental problems throughout the world.

The causes of these events have been variously attributed. Although they have certainly revealed weaknesses in centrally controlled economies and some practical limits of military power at the disposal of the nation-states, they have also reflected the growing power of information in shaping world events through the perceptions and attitudes of observers and participants alike. Many have remarked on how telecommunications may have facilitated the events of 1989-1991 and is a new factor to be reckoned with in international political developments, but others suggest that its role may have been greater: It may have been the underlying, compelling factor for the recent political changes in the world. Indeed, some see these events as the dramatic debut of a new era in which the sources of power and the nature of conflict are undergoing a fundamental shift because of the networking and shrinking of the world through information flows. A number of observers now speculate that the revolution being wrought through the information technologies—in telesensing, telecommunications, and consumer electronic devices—is fundamentally altering the nature of human transactions throughout most of the developed world. Not only are the sources and possession of power and wealth changing, even the causes and purposes of international conflict seem to be going through fundamental shifts.

At the very least, the increasing scale and scope of information flows appear to be prying open the closed societies and exposing the open societies to more of the world and its problems, and most see that as a favorable direction for peace and human rights. So far, those positive linkages between the information revolution and the world condition appear to have been mostly serendipitous, but the increasingly acknowledged role of telecommunications and the information technologies in the transformations of world commerce and international affairs raises the question of whether the awesome power of the information revolution can be deliberately or even more effectively harnessed to inhibit conflict and promote peace. For these reasons, a need exists for a long-term program dedicated to understanding the linkages and then seeking out, evaluating, and pursuing high-leverage investments in modern information technologies and techniques—investments deliberately intended to open societies and facilitate the exchange of information, to inhibit conflict and expand human rights, and generally to promote a more peaceful world.

The idea of using information technologies to advance the control of arms or confidence in security is not new. Proposals for opening the skies for the observation of military preparations are almost as old as the Cold War itself. More recently, the advent of commercial space satellites with telesensors has led to suggestions that the world at large might be given access to information which heretofore has been available only to the intelligence agencies of the superpowers and interpreted solely through their governments. There is new appreciation of the power of mass telecommunications in influencing worldwide attitudes and events bearing upon security, conflicts, and repressive governments. The power of the information technologies is not just in the collection and use of information by the nation-states or their agencies (the Orwellian vision), but also in the mass acquisition, access, and dissemination of information to almost anyone with an interest (the McLuhan vision).

The very nature of the information revolution suggests that its recent contributions to inhibiting conflict and promoting peace may have been more inadvertent than deliberate, and more in the hands of the commercial marketplace than by government policies. Indeed, the weight of national policies worldwide with respect to telecommunications and the information technologies has been restrictive more than permissive in the interests of national security and governmental control. It is the compulsions and competitiveness of the world marketplace that are eroding the restrictive policies and forcing changes upon governments. At the same time, however, it is not clear that all of the expansions in the mass acquisition, access, and dissemination of information will universally inhibit conflict;

in some cases it may facilitate new and different forms of conflict. Traditional forms of international conflict may be yielding to factional, unconventional forms of conflict—less like the Iran-Iraq war and more like the Intifada.

Differences between cultures may be important determinants of the use or even the acceptance of information intended to open up societies, enhance human rights, or inhibit conflicts. Although the opportunities to exploit modern information technologies deliberately to open societies and promote peace would appear to be promising because of their evident role in the favorable events of the past several years, that evidence remains largely limited to the most developed nations and to their proxy conflicts. The exploitation of modern information technologies to promote peace and human rights or to inhibit conflict within or between the least-developed nations or societies remains to be demonstrated.

There are at least four important reasons for care in mapping and choosing options to exploit mass telecommunications and the information technologies for positive ends:

1. The number of plausible opportunities for exploitation is very large; the number of attractive ideas is likely to exceed by many times the resources that could be made available.
2. The relationships between information and the prospects for benefits and costs are obviously complex, but not sufficiently understood as a basis for confident exploitation.
3. Some of the attractive concepts or theories would require huge investments, beyond the resources of most private ventures and all but the largest nations.
4. Some, perhaps most, of the attractive concepts will not align with the narrower interests of national governments even though they might serve the interests of the world publics at large.

In this Note, the authors review some of the historical trends and events that suggest the scope and power of the information revolution. The authors speculate how these trends and events may be interpreted in new models or theories of human affairs, in perhaps the greatest and most fundamental change since the latter part of the 18th century for human transactions of power of all kinds—political, economic, and military—and at all levels—global, national, and factional. Traditional hierarchies, based on the control of information, are being eroded and bypassed. At a time of great change, when institutions can provide for some measure of stability and continuity, many may be unable to function effectively in the face of a new abundance of public information.

The implications of change for conflict appear to be profound: reducing the prospects for conventional international warfare while increasing the prospects for unconventional transnational, factional conflicts; enhancing the technical means yet devaluing the traditional ends of warfare. Even though certain kinds of information and its processing are increasingly valuable in the prosecution of war, other kinds of information and processing appear to be even more valuable in inhibiting conflicts.

The relationships between information, the information technologies, and conflict are complex and not universally positive; but positive effects are evident and pose apparent opportunities to deliberately harness the information technologies to inhibit conflicts. We describe some of these opportunities in both general and specific terms. In general terms, we sketch the landscape of possibilities out to the horizon of the information technologies as they are currently understood, without regard to the limitations of politics, costs, or time. In these sketches we look at worlds in which anyone can listen or watch or broadcast anything that they want on global networks.

These sketches provide a background for considering more specific examples—previously or currently proposed—of opportunities that are much more modest in their demands for funding or time or political acceptance. We include several current examples from the authors' own exploratory research, selected to illustrate the wide range of possibilities and issues they raise. These initiatives range from a pan-European security information and research agency chartered under the auspices of the Conference on Security and Cooperation in Europe (CSCE) to a deployable, local information network for individuals or elites in areas of potential conflict—a network designed to facilitate cross-issue dialogues and understanding. Although the potential payoffs from investments in these and other possibilities could be substantial, so too could be the numbers of attractive possibilities and the resources they might consume. Thus, the most effective and practical exploitation of the opportunities will require careful analysis of the choices.

We conclude with an initial agenda for research into issues that need to be addressed to properly support a program for exploring and investing in high-leverage information initiatives to open societies and enhance human rights, thereby inhibiting conflict and promoting a more peaceful world. These are the issues that we will need to appreciate much more than we do now if we hope to make wise judgments in harnessing the information revolution to the positive and peaceful ends sought by most of the peoples of the world.

Whether the future will deliver all of the promises that have been perceived in the events of 1989-1991 remains highly problematical. If we are at the threshold of a new era, we are more likely to be correct in its relative importance to human affairs than we are in its ultimate forms or benefits. We need to take stock of the possibilities that lie ahead—both the opportunities and the dangers—and to identify the keys to those doors early enough for the path to be determined by choices rather than events. When we survey the landscape of possibilities to harness information and the information technologies to improve the prospects for more open societies, human rights, and international peace, we are struck by three aspects of the view:

1. The large number of interesting possibilities,
2. The potential for making major changes in the conduct of human affairs, and
3. The complexity of choices in the relationships between actions and effects and in the balances of costs, benefits, and risks.

These observations are obviously not unique to the present; one could have said the same standing at the thresholds to space and nuclear energy. More than 40 years ago, when RAND looked at the dimly perceived opportunities for the future, it had the prescience to publish a landmark study, *Preliminary Design of an Experimental World-Circling Spaceship*. A few months later, one of the report's authors only too accurately forecast the consternation and admiration Americans might feel if they were not the first to seize the opportunity to explore the new horizon. Mankind again seems to be on the edge of something new and exciting—this time the dangers and opportunities presented by the information revolution. If there is to be something unique to the present, it will be in the quality and timeliness of our actions. Another moment of profound and deep change in the world is here, and we have the chance to seize it.

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1. AT THE THRESHOLD OF A NEW ERA

DRAMATIC ENDINGS

With the end of the Cold War, the political and economic orders of the world have tumbled on their axes. Forty-five years ago, another war, a hot war, was ending. The last of the great industrial wars, waged on a global scale, came to a close with the stunning debuts of the technological marvels that would dominate the era that lay ahead: jet planes, ballistic missiles traveling through space to their targets, and the atomic bomb. For some at that juncture, these new technological gadgets were simply novel instruments to be incorporated into an ageless game, and they began to prepare almost immediately for a third world war.¹ For others, these developments marked the beginning of a new era in which the destructive power of weaponry had passed all rational bounds and had changed forever the role of military force.²

Today we stand at a similar juncture. The Cold War is over, but the ageless game of international power balancing and conflict is expected to remain, with an expanded number of participants. For others, the end of the Cold War is a symptom of a new era in which the sources of power and the nature of conflict in the world are undergoing fundamental changes—perhaps not totally for the better, but offering a new game and a new set of rules.

For almost all observers, East or West, the political events of the past several years have been stunning. Most of these events have been seen as highly favorable in their prospects for peace and human rights. They have come in a succession of deliberate steps—the winding down of the Afghan, Angolan, and Nicaraguan wars—and in a flood of revolutionary actions starting in 1989, with challenges to the authoritarian governments throughout the Communist world, the falling of the Berlin Wall, the opening of Soviet society, and the end of the Cold War. Not all these events have been greeted with enthusiasm everywhere; the repression of the students in Tiananmen Square, the failure of the Soviet economy, and the reunification of Germany have raised apprehensions in many parts of the

¹For the first decade after World War II, American military planning was predicated on the expectation of a war with the Soviet Union within the next two to four years, usually by a specific year in the future.

²It was Bernard Brodie who admonished, "Thus far the chief purpose of our military establishment has been to win wars. From now on its chief purpose must be to avert them. It can have almost no other useful purpose." Bernard Brodie, *The Absolute Weapon*, New York: Harcourt, Brace, 1946, p. 76.

watching world. But, in the main, these developments are seen as a positive new direction, as an emergence from the dark shadow of threatened war between East and West, and as an opportunity to attend to long-deferred economic, social, and environmental problems throughout the world.

The causes of these events have been variously attributed.³ Although they have certainly revealed weaknesses in centrally controlled economies and some practical limits of military power at the disposal of the nation-states, they have also reflected the growing power of information in shaping world events through perceptions and attitudes. Observers and participants alike remark that telecommunications and the news media may have facilitated these events and are a new factor to be reckoned with in international political developments.

So far, those positive linkages between the information revolution and the world condition appear to have been mostly serendipitous. But the increasingly acknowledged role of telecommunications and the information technologies in the transformations of world commerce and international affairs raises the question of whether the awesome power of the information revolution can be deliberately or even more effectively harnessed. For this reason, the authors see the need for a long-term program dedicated to seeking out, evaluating, and then pursuing high-leverage investments in modern information technologies and techniques to inhibit conflict, expand human rights, and promote more peaceful, open world societies.

Curiously, the news media themselves have generally described their role as *facilitating* rather than *compelling* change. But some observers are now suggesting that the role of the major news media may be greater; they speculate that the media have been one of the underlying, compelling forces for the recent political changes in the world.

And so the media became the force behind the domino, as the Poles inspired the Hungarians, the Hungarians inspired the East Germans and the East Germans inspired the Czechoslovaks.

[T]he power of the video and satellite underground was that, unlike Western radio broadcasts such as Radio Free Europe and the British Broadcasting Corporation, it offered visual proof that made its message undeniable.⁴

³As Meg Greenfield put it in her column (*Newsweek*, Nov. 27, 1989, p. 104): "...American policymakers and the professional-kibitzer class that attends them have greeted every momentous event that occurred with absolute astonishment. But the recovery is always quick. 'No one could have predicted what was going to happen,' we say in the first breath, and then, in the second: 'but this, of course, is why it did and what it means'."

⁴Thomas B. Rosenstiel, "TV, VCRs Fan Fire of Revolution," *Los Angeles Times*, January 18, 1990, pp. 1, 14, 15.

Indeed, some see the events of 1989-1991 as the dramatic debut of a new era in which the sources of power and the nature of conflict are undergoing a fundamental shift because of the networking and shrinking of the world due to the enormous increases in the flow of information. Many now speculate that the revolutions being wrought through the information technologies—in telesensing, telecommunications, and consumer electronic devices—are fundamentally altering the nature of human transactions throughout most of the developed world. This change extends even to the causes and purposes of international conflict. From this perspective, the end of the Cold War has been brought about not by the victory of democracy or capitalism over communism, but by the triumph of open societies in harnessing the power of modern information systems to shrink the world, to create and then exploit a world marketplace.

THE INFORMATION REVOLUTION

The antecedents of the current information revolution can be traced back to the telecommunications developments of the last half of the 19th century—the telegraph and telephone—followed by radio, television, and electronic computers in the first half of the 20th century. But it was developments in solid-state electronics, beginning in the 1950s, that brought all of these devices into practical forms that could be mass-produced and distributed to individuals throughout the world. It is the worldwide spread of cheap, reliable, and powerful information devices that is truly revolutionary. Thus, the basis for the current information revolution is not in the advent of radio or television or even computers, but in their magical transformation by the silicon chip in all of its many manifestations. Even the 100-year-old telephone was transformed. That is what sets the past 20 to 40 years apart from prior history.

Since the 1950s, the means for communicating, processing, accessing, storing, managing, and exploiting information have exploded. No dimension of human affairs, including population or depredations of the environment, seems to have grown or changed so rapidly. In the past decade alone, measurement of the information revolution on almost any dimension—*numbers* (of telephone circuits, television receivers, videocassette recorders, video cameras, or facsimile machines), *capacities* (of transmission media, storage devices, or displays), *speed*, or *cost*—is described not in mere percentages, but in factors of three, ten, or more.

Even as the objective measures of this new era peak,⁵ the enthusiasms and expectations of the world publics, particularly in the most highly developed nations, seem likely to continue to rise. Over the next several decades, the optimism about what can be done with, through, and by information could become as unbounded as that expressed for nuclear energy only 40 years ago. It seems not improbable that the power of information, in the hands of individuals, will come to be seen as a rival to that of the nation-state; that information can be used effectively to prevent war or to wage it; and that information can be exploited to perfect or destroy entire societies.

The Global Village

The information revolution is changing the world in several important, interrelated ways. It is shrinking the globe in time and is diffusing power in many forms to individuals. The diffusion of power to individuals is, in turn, eroding the relative power of hierarchies structured on the control of information, including those of national governments and their institutions. And these changes, collectively, are changing the character of many human enterprises, including the sources of power and the nature of conflict.

The new era emerging from these changes was long ago given a name: the global village.⁶ The name was not applied normatively, like "Spaceship Earth," to urge certain altruistic behavior, but objectively, to capture the nature of transactions which increasingly define how the world works. Because of the shrinking of the globe in time, transactions of all kinds have become more like those we associate with a village than those of the immense world we have known up to now. One can increasingly know things, do things, and interact with other humans anywhere in the world in ways that one could previously expect only in a small village. Just as in physical villages, the close inter-knitting of the globe may have both positive and negative aspects. Whether one prefers village life or not, the coming of the global village marks a new era in world affairs.

This new era is not defined so much by governments or alliances, as before, but increasingly by transnational markets, commerce, communities, and communications. The change has been driven by the global mobility of people and commodities, but most of all by the nearly instantaneous mobility of information and ideas. That same mobility now

⁵Colin Norman, "Rethinking Technology's Role in Economic Change," *Science*, Vol. 240, No. 4855, May 20, 1988, p. 977.

⁶Marshall McLuhan and Quentin Fiore, *War and Peace in the Global Village*, New York: McGraw-Hill Publishing Company, 1968.

bypasses old hierarchical structures in cultures, business, and governments, noticeably eroding the traditional prerogatives and powers of governments and sovereign nations.⁷ It is evident in the slow but steady dissolution of empires, blocs, and alliances, and in rising transnational movements centered on ethnicity and factionalism. Indeed, the extraordinary events of 1989-1991 and their worldwide witnessing can be interpreted as the dramatic debut of the global village.

It is no longer a great surprise that information technologies could accomplish such feats. Coming on the heels of nuclear power and space travel, modern business and consumer electronic gadgets and their capabilities seem no different from scientific marvels in medicine, travel, and warfare. But unlike most other technological wonders, the information gadgets are *diffusing* power more than they are *concentrating* it in the hands of elites. While the most spectacular technological developments—in space, weaponry, and medicine—appear to have concentrated power, the information revolution of the last 15 years has been marked and measured by the conveyance of capabilities directly into the hands of individuals. Information devices, including personal computers, facsimile machines, and video cameras, in the hands of individuals, empower them to be informed and to inform others through channels difficult for any government or other body to control centrally. And because the information technologies are increasingly required for competitiveness in nearly all human activities, the transfer of power to individuals, even where unintended, has become unavoidable. This transfer is having an effect on all aspects of human affairs: cultural, social, political, military, as well as economic.

The power conveyed by abundant access to information is now diffusing rapidly to individuals throughout the world, but especially in the most highly developed parts of the world such as Europe, North America, and Pacific Asia. Individuals and factions with free and abundant access to information and communication among themselves represent a new and obvious challenge to the authority and power that has been securely vested in the nation-state for the past 250 years. The role of television and videocassette recorders (VCRs) in the peaceful revolutions of Eastern Europe and of facsimile machines in the Chinese students' revolt have been widely described; and the role of audio tape players in fomenting the Iranian revolution (see Section 3 for more details), though probably less well known, is possibly no less significant.

⁷See Walter B. Wriston, "Technology and Sovereignty," *Foreign Affairs*, Vol. 67, No. 2, Winter 1988/89, pp. 63-75.

The world now taking shape is not only new but new in entirely new ways. Something is happening to the nation-state itself. Governments everywhere, irrespective of ideology, appear inadequate to the new challenges....⁸

The leaderships of national governments everywhere are being challenged to stay ahead of their increasingly international publics and commerce, whose access to information and communications are no longer so disparate from that of their leaders. Conservative, repressive regimes may well come to, or reclaim, power, as they have in China and as they tried to do in the failed Soviet Union coup of August 1991. But such power can no longer be sustained unless the society is closed off from the noise of the world; and not only is it becoming more difficult to close a society off, but successfully closing it off will prevent that society from participating in the prosperity to be found in the world marketplace.

The information revolution is transforming the world, but the final form of that world is not entirely clear. It may turn out to be neither a more peaceful nor a kinder world. Violence organized by the nation-states may decline, yet factional violence of all kinds may increase. Not all of the effects of this revolution will be welcomed; certainly not all of the information available will be uplifting to those watching or listening. What seems clear is that the world has shrunk to a global village or community where more and more voices can be heard and where information can be made abundant, both for the first time.

Previously, the ability of individuals to communicate freely was limited by geographic proximity, especially by national boundaries. Now information flows freely around the globe, crossing national borders with increasing ease. Even where national governments still try to isolate their populations by limiting access to information, it penetrates their borders in a tidal wave of satellite links, tape cassettes, and magnetic or laser disks. For instance, the hand of the former Soviet government appears to have been forced several times by satellite observations broadcast to the world—of the nuclear power disaster at Chernobyl and of the existence of the radar at Krasnoyarsk. Also, the democratic revolution in Albania appears to have had strong roots in Italian television; access to these transmissions could not easily be denied by the Albanian government.

Computer technology and the free communication of information are increasingly the woof and warp of successful commerce in the global village. A growing share of economic output is embodied in software, both in the programs that run the computers and in the

⁸Richard J. Barnet, "Defining the Moment," *The New Yorker*, July 16, 1990, pp. 46-60.

information which allows for the efficient management of most human enterprises. The world is entering an era where the source of wealth and power is increasingly from information and human mental creativity, rather than physical resources.

The dilemma for closed societies is the necessity to embrace the information technologies in order to keep pace with the rapidly growing affluence of the developed world. But information technology introduced to improve economic performance will end up being utilized for other purposes. Attempts to limit the availability or use of such technology only reduces the economic gains which motivated introducing it in the first place. To deny free communications is to be excluded from participation in a global economy that is growing much more rapidly than that of any closed national economy. To accept free communications is to grant the power of information to individuals who are then empowered to challenge the hierarchies which have been built on, and maintained by, the denial and control of information.

Business hierarchies were among the first to recognize the dilemma in the choice between control and innovation as they granted their employees access to modern information networks. National political hierarchies now face a similar choice. If nations are to be economically competitive, they must allow individual citizens access to information networks and computer technology, but in doing so they cede significant control over economic, cultural, and eventually political events. Symptoms of this devolution are discernible in the shift in control between Western governments and the electronic media, and in the general decline in authoritative regimes during the last 15 years. But a definitive impact of these trends on the fate of nations became apparent in the events of 1989-1991.

The Implications for Conflict

In this shrinking world, access to land, resources, or industry is becoming less controllable; national boundaries which once denied access to these things have become permeable. People and their enterprises and commerce have become transnational, with decreasing respect for national boundaries or policies. If a resource becomes or is made unavailable in one place, it can often be obtained from another. The transnational producer has increasing choices among alternative materials and production sites. Even the Organization of Petroleum Exporting Countries (OPEC) nations found themselves caught in the global web when the oil consuming nations demonstrated that they could adapt and develop new energy sources more easily than the oil producers could find new income sources; the producers' welfare has become locked into an interdependency with their consumers.

Even as the shrinking world has opened up access to commodities, facilities, and information, the information revolution has inverted their relative values. The premium is increasingly on ideas and information, the parents of innovation. What can be conceived can be made; and the choices in raw materials, labor, financing, production, marketing, and distribution are driven less by the availabilities of these things than by innovative ideas and uses of information.

Just as the technological revolution transformed forever the nature of war by releasing the enormous destructive potential of nuclear weapons, the information revolution is again transforming the nature of war by radically changing both its means and ends:

- by shifting the relative balance of power (as between the nation-state and individuals), and
- by shifting the relative value (as between things and ideas).

The waging of war has traditionally been a means reserved to the nation-states for achieving their ends. But deliberate, organized warfare is becoming doubly unattractive for the developed nation-states. Not only have its potential means become so destructive as to threaten any promise in its ends, its traditional ends no longer promise significant gains, for the things that can be conquered (territory, resources, industry) are becoming less important than people and their ideas—the very things that have been given greater power and freedom by the information revolution. In a global village, where free access to an abundance of diverse information cannot be easily denied, the imposition of a political ideology or hegemony by force is increasingly difficult and reversible.

At the same time, the diffusion of power to individuals permits them increasingly to challenge the nation-states through unconventional, irregular forms of conflict. Transnational conflicts and international terrorism seem likely not only to persist, but to increase. With roots in ethnic, religious, and market differences and in egregious economic disparities, these conflicts are likely to disturb large geographical regions—without regard to national borders—and to be exported to other areas with influence and vulnerabilities. The important aspects of these conflicts are that neither their means nor their ends will be like those traditionally employed or pursued in war. Thus, one of the more important consequences of the information revolution will be the rise of transnational factions that oppose or threaten the nation-states and which, because of their dispersed or commingled nature, cannot be effectively deterred from terrorist or subversive actions by large-scale conventional forces or even nuclear threats.

The 50-year-old revolution in scientific technology, which gave to the nation-state the enormous power of nuclear weapons and their almost certain means for delivery, now appears to be giving way to another revolution, this time about the power of information. International corporations and commerce have exploited that revolution with stunning success. Next will be the political, religious, and ethnic factions who have long had the motivations or causes to bind themselves together, but who have not had the means to form transnational communities beyond the nation-states. The new means are the mobilities of information and individuals, and the increases in the mobility of both over the past several decades are the most astonishing and profound developments of our time.

THE CHALLENGES AT THE THRESHOLD

Unfortunately, even as the advent of the global village is making regular, large-scale warfare less attractive and likely, it is also creating new stresses:

- on the global environment,
- because of economic disparity,
- in the collisions of cultures, races, and religions,⁹
- in the destructive power now diffusing to individuals, and
- in the erosion of the powers of traditional, hierarchical institutions.

These stresses cannot be ignored, not because of some altruistic sense of brotherhood, but because increasing mobility and interconnectedness imply that almost all problems can spill over to affect the quality of life even for the most favored or detached. Nevertheless, the increasing scale and scope of information flows appear to be prying open the closed societies and exposing the open societies to more of the world and its problems, and most see that as a favorable direction for peace and human rights.

⁹The crowding of peoples and cultures in the world is both actual and virtual. The actual crowding, due to population growth, while substantial, may be less than the virtual crowding brought about by the explosive increases in the mobility of information and people. Economic disparities, while certainly not new in extent or degree, are no longer so isolated or unknown.

2. THE BROAD HORIZONS OF THE INFORMATION REVOLUTION

The information revolution has already altered the world in myriad ways, but the impact of information technology is likely to become even deeper and broader in the coming decades as the technology continues to mature. The coming transformation does not require futurist projections of versatile robots and sentient computers. Some aspects of these visions may yet come to pass, but even without such technological breakthroughs, the continuation of existing trends will result in enormous changes in life throughout the planet. It is not through exotic products of artificial intelligence that information technology is transforming our world; instead, it is the more mundane effects of computers combined with high-volume communications media that are changing the way we work, play, socialize, organize, and make war.

Without forecasting additional technological breakthroughs, it is apparent that the total computational and communications facilities available on Planet Earth will continue to grow enormously for several more decades. The coming years will see the disappearance of all physical barriers to communication. Telesensing, telecommunications, and information processing will combine to interconnect the world in varied and not always obvious ways. The day is arriving when anyone in the world may choose to be a spectator at any world event as it occurs. Witness the television and radio broadcasts around the globe of live coverage, 24 hours a day, of the Persian Gulf War of 1991. Pairs or groups of individuals, regardless of location, will be able to communicate in real time, and their communication will involve all modalities: vision, sound, print, data, and intellectual constructs represented in computers. These possibilities have numerous promises, but also marked dangers. Informed actions exploiting the promises and avoiding the dangers require understanding future directions the technology may take.

THE FUTURE OF INFORMATION TECHNOLOGY

Any forecast of the technological future is vulnerable to sudden irrelevancy through an unforeseen breakthrough, or an unforeseen problem derailing a promising development. In the case of the information revolution, even the complete exploitation of existing technology (a rather conservative forecast) implies a radical transformation in everyday life. Likely future progress in such areas as robotics, speech recognition, machine vision, or automated language translation can only make future changes more radical still. The rapid

pace of technological improvement that has been driving the information revolution for the past several decades has not slackened. One-chip microprocessors equivalent in speed to a super computer circa 1980 are under development and will be sitting on desks in 1992,¹ and the deployment of fiber-optic cables is increasing the capacity of landbased communications lines by factors of thousands.² It is possible that fundamental physical limits will slow this progress later in the 1990s. It is also possible (perhaps likely) that similar technical improvement will continue for several more decades as new technologies become viable.

Even without any additional improvement in the capabilities of individual computers or individual communications lines, the available capacity for communicating and computing globally will continue growing due to increases in numbers of lines and machines. Produced in volume, microprocessor chips cost pennies to manufacture, and eventually will be incorporated in every television, every telephone, and in any other devices that handle information. Deployment of fiber-optic cable and communications satellites makes future levels of communications capacity a matter of capital investment, not technology.

Enormous quantitative increases imply likely qualitative changes. As the world becomes a single, interconnected net of people and machines, new modes of collaboration will arise—each with the potential to open new opportunities, overturn old orders, and generally catalyze change. Some of the qualitative changes in life that result from the coming explosion in capability for communications and computation will surprise observers; others may be foreseen by extrapolating existing trends or anticipating that pioneering research done in academic settings may eventually be exported to other sectors.

Numerous exciting possibilities for future information technologies can be found in university laboratories.³ More significant than particular new technologies or products are the changes in behavior apparent among those with access to the most advanced technology. Increasingly, the use of computer networks allows for collaboration across wide geographic areas. In a recent example, cooperative work on an important problem was done jointly and concurrently by mathematicians at the Massachusetts Institute of Technology (MIT), the

¹Gordon Bell, "The Future of High Performance Computers in Science and Engineering," *Communications of the ACM*, Vol. 32, No. 9, September 1989, pp. 1091-1101.

²Joseph Palca, "Getting Together Bit by Bit," *Science*, Vol. 248, April 13, 1990, pp. 160-162.

³See, for example, Stuart Brand, *The Media Lab: Inventing the Future at MIT*, New York: Viking Penguin, 1987.

University of Chicago, in Israel, and at other sites.⁴ After the initial posting of an intriguing hypothesis on the network by an MIT researcher, "17 days later...the next leap forward [was sent out on] electronic mail and their result was copied and recopied by computers around the world. Thirteen days later, [a researcher in Israel] hit the jackpot, announcing, once again, through electronic mail, that [the] original idea was correct.... Finally, 22 days later, the University of Chicago group...put the final touches on the result." Another example was the global explosion of interest in high-temperature superconductors. The cascade of breakthroughs showed no regard for geographic proximity, as laboratories in Europe and Japan raced and exchanged results with workers in labs across the United States, forming a truly international research community.

The potential for collaboration between geographically distributed individuals exists for every form of human endeavor: economic, scientific, artistic, political, educational, or criminal. Potentially, everyone will be able to create messages or other kinds of programming, including video, and broadcast their information arbitrarily. Groups can be connected as easily as individuals, and video teleconferencing could become a common form of "getting together" for either business or personal purposes. While it is evident that everyone in the world cannot usefully send messages to everyone else, exactly how this potential capability will be used is far from obvious. The limits which might be imposed by either regulation or system architecture are also unknown.

IBM estimates that by the mid-1990s there could be one billion computers around the world connected to computer networks.⁵ These networks are becoming increasingly interlinked, leading soon to a global network rivaling the international phone system in extent. This worldwide network of people and computers is referred to by some as "Worldnet."⁶ There is further potential for integration of other networks—either existing or planned—including the existing telephone system, its planned extension to an Integrated Services Digital Network (ISDN), and existing cable television systems. As these networks are integrated, the distinction between televisions, telephones, personal computers, and printed media will blur and may disappear.

⁴"In a Frenzy, Math Enters Age of Electronic Mail," *New York Times*, June 26, 1990.

⁵Quoted in Leonard R. Sussman, *Power, the Press, and the Technology of Freedom: the Coming of ISDN*, New York: Freedom House, 1989.

⁶Peter J. Denning, "Worldnet," *American Scientist*, Vol. 77, September-October 1989, pp. 432-434.

The worldwide networks will connect people to one another, and to sources of objective information about events in the world. In the global village, it will become increasingly difficult to conceal physical activities. Inexpensive video cameras, becoming ubiquitous around the world, allow events (from the 1989 confrontation in China's Tiananmen Square to the bombing of Bagdad during the 1991 Persian Gulf War) to be captured in pictures and sound and broadcast to all parts of the globe. Remote satellite sensing provides the opportunity for a birdseye view of any outdoor scene. Data concerning troop movements, changes to physical installations, or environmental changes—regardless of location—are becoming available through public channels. Telesensing, combined with telecommunications, provides the potential to view events around the planet as they are actually happening. Given demand, images of ongoing warfare, political demonstrations, and environmental catastrophes will all be available to the world's publics.

With sufficient telecommunications, and voluminous information exchange between databases, the physical location of data becomes less important than access rights defined by computer software. Potentially, the worldwide network of electronic databases will constitute an encyclopedic resource that can speed and facilitate important improvements in the conduct of government, business, and science. When and how data is exchanged will be a matter of great import, and access to data may become an important form of power. The world's databases will become a global resource, on a par with material resources, and perhaps even with manufacturing capability.

REPERCUSSIONS OF THE INFORMATION REVOLUTION

Devaluation of Geography

We now stand at the threshold of a world in which there will be little real cost associated with communication at any distance—where to a great extent, geography is abolished. Physical contact will still be important for close personal relationships, but most other relationships will be possible regardless of location. Professional, economic, educational, political, and even social relationships will increasingly occur without regard to geography. Language will still provide a partial barrier, but with visual images, music, and other cultural universals available as a common language, interaction between peoples is possible. Furthermore, once the capability to interact is established, means of communication will develop. The recent growth of English as the language of world commerce and science may be the harbinger of the general erosion of linguistic barriers in the coming world.

It is uncertain to what purposes the people of the world will put this new freedom. We already are experiencing the growing dominance of global business enterprise and the worldwide reach of some cultural forms, such as popular American music. It is not unreasonable to speculate that other global associations will arise as the ability to communicate becomes available to everyone.

Global telecommunications will affect cultures around the planet, perhaps enriching humanity by providing access to a diverse heritage, perhaps impoverishing us by eroding that very diversity. The balance between these effects is not only uncertain, it is likely to be quite nonuniform. The impact of the rising tide of information may in some circumstances be channeled by existing culture and local viewpoint. For instance, the world saw before, during, and after the Persian Gulf War how the same Cable News Network (CNN) created quite different political effects in Iraq and the United States. In contrast, other effects may be relatively independent of culture. For example, the devaluation of geography will profoundly affect the need for urban centers, de-emphasizing concentration for industry and accentuating the social and cultural aspects of cities.

Decline of Hierarchy

Human activities abound with hierarchies: business hierarchies, political hierarchies, military hierarchies, religious hierarchies, even educational hierarchies. The information revolution is making the hierarchical form of organization less necessary, and in some ways also less viable. The potential results could be both liberating and destabilizing.

Hierarchies are maintained by limits on the communication between subordinates. With the information revolution comes the growing ability of subordinates to communicate horizontally, outside of "normal" channels. This creates the opportunity for subordinates to cooperate in defiance of higher authority whenever their purposes and those of the authority do not align. Evidence of this impact can be seen in the decline of middle management and the empowerment of workers in businesses,⁷ and in the ability of dissidents to utilize communications technology to organize in recent political events in China, Eastern Europe, the Soviet Union, and elsewhere. In time, all hierarchies will feel some effect from the growing tendency to work outside the usual hierarchically defined structure.

⁷See, for example, Shoshana Zuboff, *In the Age of the Smart Machine*, New York: Basic Books, 1988; and Peter Drucker, "The Emerging Theory of Manufacturing," *Harvard Business Review*, May-June 1990.

Hierarchy can be viewed as an organizational response to limits in communication.⁸ With the removal of these limits, hierarchical forms of organization may be replaced by alternative forms made viable by the improved means of communication. The information revolution will incite significant experimentation with non-hierarchical means of organization, such as democratic, market-oriented organizations. This could be a source of new flexibility, openness, and justice—it could also provide an opening to various sorts of instability and anarchy, such as the 1991 civil war in Yugoslavia.

Information technology will have an impact on many institutions. The details of this impact may be complex, as existing institutions channel the deployment and use of technology even as they are being transformed by it. Where the challenges offered by the information revolution are met with rigidity, old institutions may be swept aside. Elsewhere, existing institutional structures may adapt and even prosper by exploiting new opportunities for improved coordination and responsiveness.

Information and the Basis of Wealth

The information revolution is deeply altering the nature of global economic activity. Just as the industrial revolution did not eliminate agriculture but increasingly marginalized it as a source of wealth and labor and as a matter of central economic concern, so the information revolution is eclipsing manufacturing. Information work has already been estimated to account for 55 percent of employment in the United States.⁹

Increasingly, the dominant capital expense will be for information, either in skill of workers or the data necessary for industry to conduct its business. Material and fabrication costs are declining relative to the cost of the information that defines the product. Computer hardware is less expensive than the software required to make the machine do something useful. As the world economy becomes information dominated, the economic product will also consist of information. The future wealth of the world will increasingly be in the form of knowledge and data.¹⁰

⁸Any organization that minimizes communication between its parts must be structured as a hierarchy.

⁹Karen Wright, "The Road to the Global Village," *Scientific American*, March 1990, pp. 84-94.

¹⁰"The crucial point about post-industrial society is that knowledge and information become the strategic and transforming resources of the society, just as capital and labor have been the strategic and transforming resources of industrial society." From Daniel Bell, "Thinking Ahead," *Harvard Business Review*, May-June 1979, p. 26.

ALTERNATIVE SCENARIOS

This much is certain: the information revolution under way will significantly alter nearly every aspect of human life. The relationship of information to the great concerns of humanity—war and peace, poverty and prosperity, oppression and liberty—is complex. Furthermore, the eventual outcome can be affected by actions yet to be taken. It is unlikely that the results of the information revolution will be either wholly positive or negative; extreme alternatives illustrate the range of possibilities.

Economic Affairs

The information revolution has already had a major effect on the global economy, as evidenced by the trend toward global markets and information-intensive forms of labor. Projections of future economic effects of the continuing information revolution are less certain. Globalization will continue, as will the increasing dominance of information-intensive labor, but businesses may structure themselves more loosely as hierarchical structures become less viable. Future corporate organizations may look more like interdependent communities of entrepreneurs and less like military chains of command.

Even more uncertain is the implication of the information revolution for issues of wealth and poverty. Wealth in the information economy could be concentrated in the hands of the few who own the data and the networks, or it could be distributed much more equitably than today. The winners and losers in the coming global information competition cannot be predicted reliably. The information revolution could free the world from want or create volatility sufficient to create enormous hardships for most people. As the technology disperses power to individuals, it may present opportunities for the "little guy," and for the marketplace, made increasingly efficient by the global availability of timely information, to replace the irrationalities of bureaucracies. However, as physical barriers to communication decline, they will be replaced by new and more subtle barriers embodied in computer software and system architecture. Those who get to write the rules of the emerging new global economic game could conceivably deal themselves a winning hand. Monopolistic control of critical data could provide the basis for economic empires. The volatility of information implies the potential for instability. It could also increase the non-linearity of power (it takes money to make money) and consequently the disparity between rich and poor. Indeed, class may increasingly be defined more by the access to and control of information and knowledge than by the possession of money alone.

Political Affairs

The information revolution is dispersing power to individuals to the detriment of some established elites. The new technological levers for undermining hierarchies hold out the promise of a new era of freedom for people around the world. Recent responses to the collapse of some hierarchies have been euphoric, and utopian visions of the future now abound. The information revolution is creating a new game of power, whose rules may indeed give political liberty a renewed chance. Human actions, however, made within the new context, will decide the political future. The information revolution is eroding old forms of power and simultaneously creating new sources. Whether the information revolution will favor individual liberty in the long run may depend on infrastructure investment and other decisions made by business and government in the coming decades. Freedom arising from distributed communications may be threatened by the use of electronic databases for surveillance and monitoring. Insight is needed into the implication of decisions made regarding the regulation and ownership of data and information infrastructure. Plausible futures could well include free people exercising their political rights electronically, masses dominated by power structures hidden in the telecommunications webs, or anarchy caused by the total loss of political stability to the volatility of information.

Military Affairs

Speculation regarding the implication of information technology for military affairs has often focused on improved weapons, sensors, or communications systems. More significant may be the effect on the military of the political and economic confines imposed by improved information availability. In an on-line, economically interdependent world, global public opinion may become a significant force. This could eventually bring an end to war as we have known it when combined with the declining economic incentive for wars of conquest and the destructive power of modern weapons systems. This is the utopian vision. On the other hand, global interconnection allows the formation of geographically distributed hostile factions immune from deterrence because there is no geographic center. A world created by the information revolution may be one with many vulnerabilities to terrorism or small-scale guerrilla warfare. Thus, the military consequences of the information revolution may be quite mixed.

Cultural Affairs

As the planet becomes richly interconnected, its people will gradually evolve a unified world culture. Whether the future world culture is a diverse pluralistic stew, or a monotonous mass culture of the lowest common denominator, cannot be absolutely guaranteed. The effect of information technology on human culture must be addressed, along with the economic, political, and military consequences. The day may come when we mourn the extinction of cultural systems and human languages, just as we now decry the death of some biological species. Cultural diversity is one of our sources of wealth. As more and more cultures enter the global village, a balance must be struck between the benefits of human understanding and the potential loss of our cultural heritage.

3. HARNESSING THE POWER OF INFORMATION TECHNOLOGY: INITIATIVES AND CONSTRAINTS

The relationships between information, the information technologies, and their effects on economic and political affairs are complex and not universally positive; but positive effects are evident and pose apparent opportunities to deliberately harness the information technologies to promote desired outcomes. The increasingly acknowledged role of telecommunications and the information technologies in the transformation of world commerce and international affairs suggests that the awesome power of the information revolution can be deliberately employed for desirable ends: opening up societies, inhibiting potential conflicts, resolving existing conflicts, and promoting human rights, all of which are implied by the generic term "promoting peace." For these reasons, we see the need for a long-term program dedicated to seeking out, evaluating, and then pursuing high-leverage investments in modern information technologies and techniques to inhibit conflict, expand human rights, and to promote more peaceful, open world societies. There is currently no foundation or other program devoted to exploiting the possibilities for peace inherent in modern information technology.

There are a wide range of potential initiatives for utilizing the growing effects of the information revolution for beneficial ends. Indeed, the greatest barrier to a program of the kind envisioned here is not that good ideas are lacking, but rather that the number of potentially useful initiatives is much greater than available funding and that more knowledge is needed to adequately evaluate the relative merits of candidate proposals.

Potential initiatives can be roughly divided into the following groups:

- providing critical enhancements to telecommunications, information processing, or telesensing infrastructure,
- providing new sources of specially critical information to be conveyed through existing channels,
- founding institutions to exploit the power of information for a focused purpose, and
- identifying and promoting improved laws, regulations, or standards to guide the future course of the information revolution.

A thorough review of new and old ideas in each of these categories would be quite extensive. This section attempts only to suggest the range of interesting initiatives through examples of existing uses, historical proposals, and a variety of notional concepts for new approaches to harnessing the power of the information revolution. The notional concepts used here are drawn from a sampling of ideas recently advanced by researchers at RAND. More extensive descriptions of these initiatives will be found in the appendices.

ENHANCING THE INFORMATION INFRASTRUCTURE

Market processes are rapidly providing enormous changes in the information infrastructure around the globe. However, the rate at which different parts of the world are being brought into the information age varies enormously with economic affluence and the policies of national governments. The actions of the marketplace do not take into account the contribution to peace and prosperity that could result from accelerating the entry of critical groups into the global village. Important results may be attained by providing the infrastructure required for improved communications among peoples whose social stability is in peril, within countries where an opening to the outside world is desired, or between groups which have the potential to create conflict. Some observers of the world scene have asked whether the government in Beijing is best opposed by dropping bombs or facsimile machines on the countryside. Others have also speculated whether the stability of the Philippines or Peru is best assured through military aid or by providing telephones to the farmers.

There are numerous historical examples of significant social or political effects created by the introductions of low-cost communication systems. In 1971, the National Aeronautics and Space Administration (NASA) donated free use of the ATS-1 satellite to the University of Hawaii for the purpose of building a satellite communications network for the North and South Pacific Islands (that part of the world our geography books call Oceania). The project was called PEACESAT.¹ The network, built entirely from local funds, ultimately consisted of some 35 ground stations allowing two-way voice, facsimile, and low-scan TV communication. The terminals, some of which were solar powered, cost between \$2500 and \$9000 (circa 1970-1980). After hurricanes knocked out local power, these terminals were often the only communications link to the outside world for such places as the Cook Islands and the Truk Islands.

¹"PEACESAT," a video/presentation on NASA Select TV, July 10, 1990.

The system eventually included at least 11 countries and covered most of the South Pacific, New Zealand, Australia, the Philippine Islands, Southeast Asia, Japan, and Hawaii. While it was used mostly to extend educational opportunities and medical expertise to isolated islands, many of those who participated in the network also believed that the system helped recreate a sense of regional identity that colonialism had undermined. It was pointed out that before PEACESAT, telecommunication among islanders with different colonial masters was virtually impossible; sometimes even the mail had to be routed through the "parent" countries before it could reach a destination several hundred miles away. Unfortunately, the satellite was shut down in 1985; but in creating common medical and educational institutions, PEACESAT was seen as an important part of the decolonization process in Oceania.

Another example of alternative mass communication networks was demonstrated in Iran in the 1970s. While the Ayatollah Khomeini was in exile from Iran, he made extensive use of an inexpensive, widely available modern information technology to maintain contact with his coreligionists and pave the way for his eventual rise to power. From his base in Paris, the Islamic leader regularly recorded his sermons onto audio cassette tapes. These cassettes were smuggled into Iran and recopied multiple times on simple dual cassette tape player/recorders by devout Moslem followers of the Ayatollah. By distributing his message directly through and to his religious following, Khomeini completely bypassed the traditional means of mass communication—radio and newspapers—and thus skirted the Shah's control of those institutions. By the time the Shah fell, Khomeini had become a formidable political force despite the fact that he had been driven from the country and remained away for many years.

A related type of activity is a set of information-sharing initiatives, utilizing transnational electronic mail networks to link academics, industry, military, and other organizations. These have been largely self-organized happenings under some benign, non-regulatory aegis. For example, PeaceNet/EcoNet is an electronic mail/bulletin board system run by the Institute for Global Communications; the main computer is located in California and users access the network directly or by linking through Telenet. Users around the globe, from Tasmania to Finland, have access to the information posted. Electronic bulletin boards on hot and open issues provide a means for interested individuals around the world to find one another, communicate, and potentially begin coordinating their activities. It was this network that the Chinese students tapped into so impressively in June 1989.

Recent technological advances in the information sciences have made it theoretically possible to contemplate a world in which every person on the planet is both a broadcaster and a recipient of information. Appendix A sketches a global person-to-person communication network and describes hardware options that could put a terminal within reach of all, even in remote "third world" areas. A demonstration project is described for a deployable local network, possibly in the Jerusalem/West Bank area, to assess better the technology requirements involved with setting up advanced communication systems in less-developed areas. It also describes transmission scenarios which build primarily on existing networks and systems, and it poses a series of questions and outlines policy areas that could form the kind of research agenda needed to prepare for global "many-to-many" communication.

Improved communications within geographic regions could promote regional integration with important benefits for both peace and prosperity. An example of such a concept is presented in Appendix B. A Council for North American Information (CONAMI), covering the United States, Canada, and Mexico, could analyze how the spread and application of the new information and communications technologies could affect the prospects for conflict and cooperation in North America. Elites from all three countries would participate in a special network, and possibly a research center, to collect, share, and discuss information about key issues for North America. A CONAMI-type network might be relatively easy to set up in the United States and Canada because of extensive modern information infrastructures, but it would be a challenge—technically, economically, and politically—for Mexico. In addition to the primary task of enhancing communication flow between the three countries, CONAMI would provide the opportunity to study ways of improving the information infrastructure within countries; to determine the relationships between economics, politics, and information; and to research the role of information in the generation and resolution of conflicts and in the preservation of peace.

SOURCES OF NEW INFORMATION

The growing internetting of the globe, with the attendant power to mobilize the world publics, opens options for influencing events by providing sources of information that otherwise would not be available. Information regarding military affairs has an enormous potential effect upon issues of war and peace, but it is often unavailable to the public due to the efforts of governments to conceal their actions and capabilities.

Many previous proposals have emphasized conflict avoidance through devices to provide better visibility of military preparations for national governments. "Open skies" policies have been subject to debates between national governments since President Eisenhower first proposed the idea in 1955. With the advent of satellite-based reconnaissance in the 1960s and the recognition of national technical means of verification in strategic arms control agreements, the reality of open skies has been widely accepted as inevitable. But recent satellite monitoring breakthroughs have added whole new dimensions to these activities. In the last few years, private individuals or institutions have bypassed their national governments and used commercially available satellite imagery to support their efforts to describe, analyze, and change international security policies.

Interest in the feasibility of some type of multinational satellite monitoring institution or some other transnational monitoring concept as a promoter of international peacekeeping dates from a 1978 French initiative that proposed the creation of an International Satellite Monitoring Agency (ISMA). This proposal would have established an independent agency, run under United Nations auspices, to monitor both international arms control agreements and crisis areas. It was suggested that ISMA would initially acquire imagery from civilian earth resources satellites (such as the U.S. Landsat), but that the agency would eventually operate its own satellites. The proposal was rejected on the basis of anticipated operational costs and concerns about the dissemination of sensitive remote sensing information, but in 1988, France submitted a revised version of the proposal to the Third Special Session on Disarmament. This version calls for a United Nations agency to examine data from a group of international civilian satellites—not satellites owned by the ISMA as previously proposed—which would watch for possible arms control violations and escalating military tensions between nations.

In 1987, two analysts at the Norwegian Institute of International Affairs, with support from The Ford Foundation, used Landsat imagery to identify and analyze Soviet military facilities on the Kola Peninsula. The work provided the unclassified research community with a view of Soviet military operations previously available only to those holding a security clearance. For example, their research identified and described in detail two major bases previously unrecorded in open sources.²

²Tomas Ries and Johnny Skorve, *Investigating Kola: A Study of Military Bases Using Satellite Photography*, London: Brassey's, 1987.

In March of that same year, the Space Media Network, a private Swedish company, released SPOT images (from the French-owned *Satellite Pour l'Observation de la Terre*) of the controversial Soviet radar at Krasnoyarsk, which was widely considered to be a violation of the U.S.-Soviet Antiballistic Missile Treaty. Later, the ABC television evening news program used SPOT images of the radar and interviewed a physicist specializing in arms control issues to explain their meaning and significance. After several such releases of SPOT imagery, the Soviet government invited U.S. Congressmen and defense specialists to inspect the facility and eventually agreed to dismantle it.³

Later in 1987, SPOT and Landsat imagery were used by the major media to assess and publicize the Chernobyl disaster after Soviet officials first denied and then attempted to downplay its occurrence. As the world became aware of the scope and scale of the incident, the Soviet government gradually became more open about the shortcomings of its nuclear power program.

A 1988 book on the spread of nuclear weapons utilized SPOT imagery to help confirm the existence of Pakistan's Kahuta uranium enrichment facility.⁴ The evidence was an important element in making the existence of a Pakistani nuclear weapons program credible to the world community.

A 1989 study conducted by the Carnegie Endowment for International Peace demonstrated that commercially available satellite imagery could be used to identify military facilities or capabilities in a general or precise way. Radars, supply dumps, major headquarters, airfield facilities, aircraft, rockets and artillery, missile sites, surface ships and surfaced submarines could be identified from imagery supplied by SPOT or Landsat.⁵ The analysis of such images conducted by private firms supporting the study suggested that even more information could have been gleaned from the images, given additional time and funding.⁶

³See Ann M. Florini, "The Opening Skies: Third Party Imagery and U.S. Security," *International Security*, Fall 1988, p. 103; and Peter D. Zimmerman, "Remote Sensing Satellites, Superpower Relations, and Public Diplomacy," in Michael Krepon et al. (eds.), *Commercial Observation Satellites and International Security*, New York: St. Martins Press, 1990, p. 37.

⁴Leonard Spector, *The Undeclared Bomb*, Cambridge: Ballinger, 1988.

⁵Peter D. Zimmerman, "Introduction," in Krepon, *ibid.*, pp. 203-204.

⁶William A. Kennedy and Mark G. Marshall, "Observing a French Nuclear Weapons Deployment Area," and Donald Vance and William Bumbera, "Imagery Analysis and Installations of Ground Forces," in Krepon, *ibid.*

Initiatives for providing new sources of information can include not only new sensors, but also new means for providing existing but inaccessible information in useful form. Organizations collecting diverse pieces of information and providing cogent synopses could bring information to public awareness that otherwise might go unused. For example, Appendix C describes a concept for assisting news organizations by adding a new security dimension to their coverage of international news events. Since the media—especially television—played such a pivotal role in the amazing events of 1989-1991, it is hypothesized that if complete information regarding conflict situations is immediately and continuously available to the media for worldwide public dissemination, it will have the effect of inhibiting conflict. As an experiment, it is proposed that professional analysts trained in the collection, analysis, and dissemination of information on military developments and conflicts act as a research adjunct to an existing major news organization, such as Cable News Network (CNN). If this adjunct group is staffed properly, integrated into the existing news apparatus, and also provided with security data collected by, say, the satellite monitoring agencies described elsewhere, it should be possible to deliberately assist in the avoidance of some future conflicts.

INSTITUTIONS TO EXPLOIT THE POWER OF INFORMATION

A rather different sort of initiative is the founding of institutions to accomplish specific goals using the power of information. Such institutions might exploit any of the previously mentioned means to accomplish their ends. These institutions could potentially be supranational (e.g., an agency of the United Nations), international (established by governments), or transnational (e.g., a nonprofit corporation) in scope.

Numerous professional institutions have developed over the years to exploit the power of the information revolution for business purposes. For example, Arthur Andersen is a multinational corporation with \$2-3 billion in revenues distributed over an international group of 2000 partners in 52 countries; of the 240 worldwide offices, about 86 are in the United States. There are partners who are citizens of most of these countries. Pro forma headquarters is in Switzerland, but direction is from Chicago. The organization is devoted to information sharing and is information intensive; knowledge gained in one office is leveraged to the next. Arthur Andersen's business is to provide the information necessary to run other businesses—tax, audit, and now, before all, consulting: systems analysis, strategic planning, information systems integration, competitive advantage, etc. The whole network is held together by an aggressive training of junior staff to form a "common (transnational)

culture." Like a medical residency training, the system is an agreed-upon pyramid. Over the 10-12 years it generally takes to reach partnership standing, the vast majority use their training and leave. There is also a steady outflux of partners into industry. There are similar examples of businesses involved in advertising, merchant banking, investment, and law.

The London-based International Institute for Strategic Studies (IISS) was set up because it was felt that governments had a monopoly on information concerning nuclear weapons and strategic policy, and that there was a need for a public counterweight to inform and challenge government policy. Thus was born *The Military Balance* (an annual IISS publication describing and listing the world's weapons and how many of each the countries of the world have), originally about a 10-page pamphlet. The document, and indeed the whole enterprise, grew enormously and gained considerable respect and credibility. In the mid-1980s, the *Balance* came under attack from a number of quarters, especially by those who felt that it either (1) was wittingly or unwittingly a dupe of the Reagan Administration's push for a U.S. military buildup (especially in strategic forces), or (2) that the "bean counting" methodology fostered an exaggerated sense of military capability. The enormous methodological, analytic and fact-finding problems in such an effort are a caution against too easy use of terms like neutrality, objectivity and nonpartisanship. In particular, the question of what to leave out and the simple task of constructing the right boxes in which to place information have enormous consequences for the "impact" that presenting the information is likely to have. The principal virtue of the IISS approach is that the information is placed in the public domain, and therefore is more easily open to review and challenge.

Another transnational institution working to promote peace is Amnesty International. This organization works from the premise that there are common overriding principles of morality that embarrass even the most hard-hearted of governments. This is particularly true if the light of open information is directed at "incontrovertibly" reprehensible behavior, such as political imprisonment, slavery, torture, or political killing, where the conspiracy of injustice is surrounded by deliberate secrecy or the avoidance of discussion.

A recent idea is for creation of a supranational, pan-European (which also includes the United States, Canada, and Russia) security information and research agency, operating in conjunction with the 35-member Conference on Security and Cooperation in Europe (CSCE). At the outset, this agency would collect information from governmental and private sources and conduct on-site, aerial, and satellite monitoring in order to supplement (and hopefully quickly supplant) arms and security monitoring operations by governments

and involved alliances, such as NATO. The long-range goal, however, would be for the agency to develop its own systems to collect, process, analyze, and disseminate information relevant to the enforcement of peace in Europe, and perhaps even to acquire the expertise and prestige to act in a quasi-judicial capacity when necessary. (This concept is described more extensively in Appendix D.)

Several concepts for agencies to promote international peace by exploiting the current state of the art in satellite imagery have recently been advanced. The ideas in Appendices E and F range from a private transnational institute which would disseminate commercially available satellite imagery to a powerful multinational satellite monitoring institution which would own and control satellites, technology, and the analytic and perhaps even the dissemination apparatus. The information goals of these ideas span a similarly wide spectrum, including:

- a clearinghouse where imagery data is available but not necessarily actively disseminated,
- an active monitor of movements and events within and between countries, supplying data on such things as arms control verification, international crisis monitoring, and drug shipments, and
- an environmental monitor, collecting information on ozone mapping, rainfall measurement, earth biological changes, global vegetation, and pollutants in the atmosphere.

INFLUENCING LAWS, REGULATIONS, AND STANDARDS

Decisions regarding laws, regulations, and standards could influence the pattern of investment and determine the long-term global impacts of these technologies. (A survey of some of the legal issues is contained in Appendix G.) Technological progress significantly leads both national and international law, and there is real danger that either inappropriate restrictions or inadequate restraints could produce negative effects. Research initiatives into the impact of such decisions on the prospects for more open societies, human rights, and international peace could have significant importance in helping society sort through its options.

Issues of importance include, but are not limited to:

- rights and responsibilities of governmental and nongovernmental organizations regarding transborder data flows,
- free information flows versus national sovereignty,
- international communications consensus regarding content restrictions,
- issues of jurisdiction,
- international regulations regarding the use of electromagnetic frequency spectrum and stationary satellite orbital position,
- legal resolution of problems resulting from the vanishing distinctions between print media, broadcast media, computer software vendors, and common carriers,
- issues of property rights to information and software products, and
- international telecommunications standards.

CONCLUSION

The sample initiatives for deliberately exploiting the new technologies described above, especially when viewed against the backdrop of recent world events, indicate that movement toward the exciting new global information landscape, sketched in Section 2, is already gathering momentum. And these initiatives are only a small sample illustrating the span of what is truly possible. Taken together, however, they provide a sampling of ideas about how the information technologies can be used to instigate the movement toward a more information-rich and cooperative world. They also demonstrate that there are real choices posed by going in radically different directions in the new information landscape—and that each direction has its own set of legal, political, military, economic, and social consequences.

4. RESEARCH AGENDA

Modern information technologies have the potential to serve as important instruments of social change in the service of peace, prosperity, and justice. The course of the information revolution could take a wide range of future directions, and the eventual outcome of current trends is to no small extent a matter of public choice. Informed actions (or the lack of them) will influence the information revolution and the kind of world it will create.

The tremendous economic forces driving the information revolution provide significant potential leverage for those initiatives that can influence or utilize the changes already under way. However, there are many more interesting ideas for harnessing the power of information than are likely to be pursued in the near future. Any program to use this power to avoid conflict or promote more open societies, human rights, or any other worthy goal, must be based on an investment strategy emphasizing initiatives of high leverage.

Selecting from the abundance of potentially interesting ideas that may be advanced will require greater knowledge about the relationships between information, information technology, and their social effects than is presently available. A broad program of research and analysis is required to improve our understanding of the potential these modern information technologies hold in order to effectively harness, focus, and direct this new force. Knowledge is especially needed regarding the following:

- the impact of the information revolution on political relations, in various cultures, under various political systems;
- the utility of information and information technology for the avoidance or resolution of conflicts of various sizes and types;
- the impact of the information revolution on the sources of conflict, including economic disparity, cultural intolerance, and natural resources;
- possible laws, regulations, or standards that will affect the future course of the information revolution;
- the social consequences of existing or potential information systems; and
- the characteristics of potential high-leverage investments to promote peace.

Basic and applied research is needed in all these areas. Basic research should be geared toward building new knowledge, both through the development of information-centered models of society, and through case studies in the enumerated policy issues, using the existing methodologies and experience of the social and technical sciences. The knowledge gained would inform two types of multidisciplinary applied research on specific potential future investments:

1. Analyses of the potential effects of alternative public policies on the prospects for peace, individual rights, human welfare, and the inhibition of conflict.
2. Analyses of the cost effectiveness of alternative approaches to the use of modern information technologies in support of particular objectives.

In addition to the agenda of basic and applied research outlined below, many of the appendices contain similar, but more detailed, agendas to assess the feasibility and payoff of specific initiatives.

BASIC RESEARCH QUESTIONS

The implications of the information revolution are presently understood primarily at the anecdotal level, although more is known about economic than political effects. Focused research can provide an improved basis for decisionmaking.

Information and Political Affairs

The control and use of information clearly has an important role in political events and as a basis of power in society. The nature of this role is much less well understood than are other bases of political power. A better understanding of how changes in the dissemination of information can affect political affairs would be useful in judging the potential impacts of changing flows from the deployment of new information systems. Whether the effects of information differ from culture to culture, depending upon affluence, or between different political systems, is also of great importance to the efficacy of potential initiatives. It is important to understand when the broad dissemination of information leads to fragmentation of power and increased individual initiative, just as there must be knowledge of what options societies have to build new and constraining control structures.

Information and Issues of War and Peace

The evident role of modern information technologies in favorable events of the past several years suggest that the technologies could be intentionally exploited to promote peace. However, the relationships between information, the information technologies, and conflict are complex and not well understood. Basic research is needed to illuminate these complex relationships.

The results of advancing information technology may not be universally positive. The evidence for a positive role is generally limited to conflicts between the developed nations. Information technology may have somewhat different effects when introduced into third world societies, and may promote new forms of violence even as it makes international conflict less likely. Because war between powers possessing nuclear, chemical, and/or biological weapons could be so horribly destructive, measures to prevent such conflicts deserve consideration even if the role of information technology generally is found to be mixed.

Information technology may have an influence not only on the initiation or resolution of conflict, but also on the sources of conflict: economic disparity, cultural intolerance, demographic pressures, and environmental or natural resource issues. It affects the capabilities for warfare, defending against surprise and untoward aggression in some cases, or conversely, being exploited to gain an aggressive advantage in others. A more complete understanding of all the roles information and information technology may play in future conflicts of various sizes and types will be vital to making sound decisions among possible options.

Social Consequences

Knowledge of how the concentration or distribution of information can affect the prospects for a peaceful world and/or more open societies must be combined with an understanding of which characteristics of information systems promote wide distribution of information and which characteristics allow for more centralized control. Such an understanding can be gained from focused technical studies into the potential uses of specific technologies or systems. Questions of this kind may become quite complex. Emerging information technologies and systems may have subtle effects on issues of personal privacy. Recent problems with computer "hackers"¹ are a preview of security problems that will pose difficult dilemmas in the coming years.

¹See, for example, Clifford Stoll, *The Cuckoo's Egg*, New York: Doubleday Publishing Co., 1989.

APPLIED RESEARCH

Efficacious use of available funds will require that knowledge gained through basic research be put to use in evaluating and selecting between potential initiatives. Analyses will be needed of proposed institutions and initiatives to determine the merits and uncertainties associated with each. Any of the concepts presented in Appendices A through F could be the subject of such an analysis. Additionally, analyses of the attributes of proposed policy options or information systems may be desired.

Exemplary Studies for Policy Analysis

The information revolution is outrunning the rate at which laws and regulations can be altered to adapt to changing realities. Issues of personal privacy, freedom of the press, personal property, and legal jurisdiction are being fundamentally affected by changing technology. As laws and regulations are revised to deal with novel demands, there will be decisions at the national and international levels that will have far-reaching effects. It is important that decisionmakers have the benefit of good analysis of the results of potential decisions on issues such as economic development, political stability, national security, and individual rights.

There are a wide range of future public decisions that will benefit from such analysis. Proposals for international agreements on satellite monitoring could have implications for national security and the international climate for peace. Trade restrictions on information technology must trade off potential effects on national security, the political evolution of trade partners, and economic prosperity. As journalism, publishing, computer software, and common carriers become increasingly difficult to distinguish, legal definitions have the potential to affect personal liberties, the political health of the nation, economic prosperity, and the long-term course of the information revolution. The mobility of information, together with the growing economic importance of software, makes questions of intellectual property rights much more difficult at the same time they are becoming increasingly important.

The information revolution is being driven by market forces, but the market operates within ground rules established through laws and regulations, and responds to industry standards once they have been promulgated. Consequently, enormous leverage to alter the future course of the information revolution can occur through thoughtful and insightful influence on emerging laws, regulations, and standards. Careful research is needed on both the desirable characteristics of specific future global information systems and the possible

impact such laws, regulations, and standards may have on the future evolution of the information infrastructure.

Exemplary Systems Analyses

Decisions to invest in particular initiatives to achieve specific ends require detailed analyses of all associated merits and uncertainties. Such analysis may need to consider:

- information systems (hardware and software),
- information products (to be delivered on existing systems),
- institutions within which the power of information is used, or
- some combination of these.

Such analyses may involve technical, legal, economic, political, or social aspects. Technical issues, such as the minimum possible cost of mass-produced satellite receivers, may be amenable to concrete answers. But other questions involving social effects, such as the trade-offs between economic and social implications of modernizing existing land-lines in Eastern Europe versus deploying space-based communication systems, may have significant uncertainty. Nonetheless, carefully conducted policy analysis can make important contributions to effective decisionmaking on these issues.

The goals of initiatives to promote peace, open societies, and improve human rights are not easily measurable. Initiatives based on the power of information gain their leverage from the ongoing process of change that on its own will potentially transform many aspects of society. Consequently, deciding among competing vehicles for using the power of information to promote peace is problematic. There is a need for research into the payoff of similar past initiatives, and for a methodology for making insightful decisions on future investments.

Fundamental Theory Development

The research issues described here can be addressed in part through case studies, systems analyses, and other techniques of the social, political, and information sciences. However, effective research into these important topics is impeded by the lack of a theory of society based on information flows and relationships. Economic models exist that support reasoning about the effects of economic changes. Political models of society support reasoning about the importance of power relationships. Until we have models that describe

society in terms of information, we will be fundamentally limited in the depths to which we can reason about the effects of changing information technology. Furthermore, information-centered models of particular societies cannot be constructed until we have generic models of the social effects of information technology that provide a portfolio of concepts and modeling conventions.

Modeling society in terms of information is difficult in that these models must deal with trajectories and transients, and not just equilibria. However, just as the use of digital computers and nonlinear mathematics is potentiating the ability of economists to investigate nonstationary economic systems,² so too are information-centered models of society becoming feasible for the first time.

CONCLUDING THOUGHTS

If we are at the threshold of a new era, as we were at the end of World War II with the dramatic emergence of the technological revolution, then we are likely to be more correct in recognizing the importance of the information revolution to human affairs than we are in its ultimate forms or balance of benefits. As with the thresholds to space and nuclear power, it behooves us to take stock of the possibilities that could lie ahead—both the opportunities and the dangers—and to identify the keys to those doors early enough for the path to be determined by choices rather than events. When we survey the landscape of possibilities to harness information and the information technologies, we are struck by three aspects of the future:

- the large number of interesting possibilities,
- the potential for making major changes in the conduct of human affairs, and
- the complexity of choices in the relationships between actions and effects and in the balances of cost, benefits, and risks.

Those observations are not unique to the present; one could have said the same standing at the thresholds to space and nuclear energy. If there is to be something unique to the present, it will have to be in the quality of the exploratory surveys and the early choices made.

²See for example, Brian Arthur, "Positive Feedbacks in the Economy," *Scientific American*, February 1990.

More than 40 years ago, when mankind stood at the dimly perceived threshold to space, RAND published its first landmark report on the promises of a world-circling spaceship and speculated on its implications for the nation and the world.³ It turned out to be ten years before the fact; but in a follow-on paper only nine months later, one of its contributors, James E. Lipp, anticipated quite precisely the event that was to profoundly shock the American public in 1957 and to influence its government's policies for several more decades:

To visualize the impact on the world, one can imagine the consternation and admiration that would be felt here if the United States were to discover suddenly that some other nation had already put up a successful satellite.

The opportunities to improve the prospects for peace offered by modern information technology are enormous and profound, even as they, too, are but dimly perceived. The demonstrable role of advanced telecommunications and telesensing systems in recent political events around the world demands more attention from citizens, analysts, and decisionmakers with an interest in issues of international security. In 1957, Americans greeted the Soviet launch of Sputnik (the first manmade satellite) with great shock, fear, and perhaps awe if not open admiration. U.S. leaders were late in grasping the true significance of space to the future of world politics and late in acting on that appreciation. Such errors of judgment should not be repeated as we view the broad horizons of the information revolution. It is now time to begin shaping the future we desire. It is now time to seize the moment.

³*Preliminary Design of an Experimental World-Circling Spaceship*, Report No. SM-11827, RAND, May 2, 1946.

Appendix A

DEPLOYABLE LOCAL NETWORKS TO REDUCE CONFLICT

by

Robert Anderson and Norman Shapiro

No one doubts the tremendous and powerful effect of information. It is exciting to contemplate the possibility of information being made freely available to all people on the planet and to speculate how the new information technologies will be used to open societies and promote peace.

Consider some of the forms information can take: textual messages (cables, telegrams, electronic mail and bulletin boards, and major media news services); pictorial information, both individual photographs (the single Chinese student stopping a tank near Tiananmen Square) or television (TV) sequences searing images into our minds; maps, charts and diagrams succinctly summarize events. Information is voice, music, audio—containing powerful messages often affecting human emotions and providing subjective cues in addition to the explicit message. These forms may be one-way from sender(s) to recipient(s) or highly interactive, permitting dialogs and multilog.

Information is often gathered, processed, or disseminated for a particular purpose: to inform, disinform, educate, persuade, excite, incite, entertain.¹ Sometimes we process information just to create new information. Many other processes also are used to create or to restrict information: translation, “filtering” (culling certain information from a larger collection), “fusion” of dissimilar data items into new ones, interpolating, encoding, encryption, etc.

Distribution provides a particularly wide spectrum, ranging from distribution instigated by the *sender*, targeting an individual, a specific distribution list, or broadcasting widely; to dissemination instigated by a *recipient* by querying a database, subscribing to a service, or visiting a library.

¹None of the categories mentioned in this appendix are complete or definitive. They are meant only to stimulate the reader to add and combine the attributes into novel combinations and new opportunity pathways.

While rich sets of options enable information flow in various modes, forms, and patterns, many means have been developed to *forbid*, *restrict*, and *inhibit* information flow. Any use of information to good ends must consider the tendency of organizations, governments, and even individuals to regulate information (e.g., taxation or licensing), and to restrict by content (e.g., obscenity or espionage laws), by source (legal inadmissability of wiretapped calls), by structure (taxing the duration of a telephone call), or physical means (restricting physical access to typewriters or photocopying machines).

These categories and examples only hint at the dimensions of the landscape of options and opportunities to be considered. Reaching toward the horizon, the authors anticipate a world with gigabit-per-second fiber-optic cables weaving people together, and high-definition display devices and computers in millions of homes and businesses and community gathering places. In this kind of world, transmitters, receivers, and available bandwidth will no longer restrict the flow of information and new forms of global discourse will become possible.

GENERAL CONCEPT

We envision a future world of "many-to-many" communication, in which anyone, anywhere, is both a potential broadcaster and a recipient of information. The term "many-to-many" requires explanation. An ordinary two-person conversation, in person or by telephone, is an example of a one-to-one communication. An information meeting is an example of few-to-few conversation. A broadcast, a newspaper, and a printed book are examples of (one or few)-to-many communication.

It is important to understand the complete significance of many-to-many communication. For instance, several hundred people talking in a Greek forum or Viennese coffeehouse still constitutes one-to-one communication. The orders of magnitude difference in hundreds of thousands or tens of millions of people intercommunicating creates fundamental qualitative differences for which we reserve the term "many-to-many." Although the world was significantly changed by the advent of printing and broadcasting, or one-to-many communication, the impact of a global many-to-many communication network will be even more astounding.

The three fundamental premises which underlie this concept are hypotheses that should be further analyzed and verified:

- As collections of people in different countries, regions, and cultures communicate directly, often, and interactively with each other, they will understand each other better, reducing tension and conflict;
- If everyone has the potential to broadcast over a diffuse, decentralized information network, there is less opportunity for any group to control the content or flow of information;
- Widespread communication among people is incompatible with maintenance of closed societies, which have a greater tendency to create international conflict than open ones.

Recent technologies, such as electronic mail and facsimile machines, have already introduced for the first time the possibility of many-to-many communication. But what would it really take to put all people of the world in direct contact with each other? What issues must be considered in attempting to do so?

Some Ideas About Hardware

Everybody in the world would potentially be able to send and receive messages into a collection of interconnected networks. First, he or she needs access to a "terminal" capable of such actions. Middle- to upper-class members of "first world" societies could tap into existing networks with personal computers, computer terminals, modems, and similar systems such as the French "MiniTel" system. The harder question is how a Samburu tribesman in Kenya, a Hindu clerk, or Jordanian Arab shopkeeper could participate. At a minimum they would need a terminal with a keyboard labelled in a relevant alphabet. The terminal would have to be capable of recording a typed message, storing it within a memory chip in the machine for editing or later transmission, transmitting it by radio frequency to a collection antenna, and receiving, storing, and displaying messages received from a transmission antenna. Perhaps only 1000 or 2000 characters might be stored at any time. The display might only show three lines of 40 characters, or some similar quantity. The cheapest form of terminal might require no battery or external electric power at all, but be "chargeable" by operation of a handcrank (e.g., running a small internal generator, charging an internal rechargeable battery or capacitor).

This minimal terminal might be air-droppable, extremely rugged, and manufactured in large numbers for maximum economy of scale. It would be capable of transmitting a signal that could—if no local earth station were within range—be received by a satellite equipped for this purpose. Some terminals might employ techniques that would make it hard for governments to use other electronic devices to discover their use.

Other terminal variations might be battery operated, line voltage-operated, have larger displays and memory, be capable of accepting and transmitting input from a video camera, be capable of using a TV set as a display, and so on.

Some Ideas About Transmitting Information

The information broadcast might come from a network of satellites capable of relaying signals anywhere in the world. Rather than requiring an expensive, dedicated satellite system, it might be possible to cooperate with other systems currently being planned.² In general, existing systems and capabilities would be used wherever possible.

Areas for Research

Even this brief sketch is enough to raise serious policy issues that need to be addressed. The following list of questions is by no means exhaustive.

- What percentage of the world's population already has access to information terminals, and what percentage does not?
- To what extent do existing and planned networks span the globe? Are there "information have-nots" who need attention?
- How do we create a worldwide universal addressing scheme so that any individual (terminal) can address a message to any other, as well as "posting" messages on electronic bulletin boards?
- Should encrypted messages or messages in which the sender is anonymous or disguised be allowed? Is it possible to prohibit this even if it seemed desirable?

²"Motorola Plans Global Cellular Telephone System," *Los Angeles Times*, June 26, 1990, p. D1.

- Although there is the assumption that information is good, should all information really be allowed, including a recipe for a designer drug or atomic bomb, a plan to poison water supplies, commercial transactions, negotiations of contracts to kill someone?
- Would any node or authority in the system have the ability to control the content or flow of information? Would any person or agency be able to view messages not addressed to them or posted for public access?
- What kind of inter-language translation facilities would be required?
- Would some countries use this system as a substitute for creating effective national communication systems? If so, is that a beneficial or negative outcome?
- Are textual messages a sufficient communication service, or must the system be capable of transmitting TV images or other pictures?
- Will millions of broadcasters throughout the world make it impossible for a country or corporation to retain private or secret information? If so, can modern market-oriented societies operate under those circumstances?
- Would individuals electronically “yelling” at each other (sometimes called “flaming”) due to lack of traditional social norms and additional cues, such as facial expressions, body language, etc., exacerbate rather than help communication across cultures and societies?
- Is electronic communication too quick in some instances? Is there an advantage to letting passions of the moment have a chance to subside before actions are taken?
- Would the volume, the differing languages, and the potentially high ratio of “junk mail” to “worthwhile mail” cause the system to collapse under its own weight, or at least be useless to any one individual?

Some scattered research already exists on some of these issues and the authors have some ideas and working models on others. But an all-out research effort will make a major contribution if it can begin to assemble the answers to these questions so that many-to-many communication can become a reality.

A POSSIBLE EXPERIMENT

Since it is clear that a global network like this cannot be deployed in the next two to five years, it is worthwhile to consider small, tangible, specific steps that can be taken now to explore and demonstrate this concept. To help understand the space of possible options, it might be desirable to set up a limited experiment of a deployable local network in one specific conflict region to see if it is feasible and has some demonstrable effect at reducing the conflict.

In choosing the area for the demonstration network, it will be necessary to be aware of four major parameters that define the space of possibilities:

- The class of people served (elites; some professionals; everyone)
- Geography (a limited range, e.g., 20 miles; a country; the world)
- Medium (text messages; voice; audio such as signals and music; video including multimedia)
- Time (how long the system is installed and available—for four weeks during an incipient conflict; for a one-year trial period; indefinitely)

By choosing various options within these four parameters many possible demonstrations could be sketched, but for this specific experiment the authors propose a deployable local network for a regional conflict that would (1) serve everyone in a local region of (2) about 20 miles' diameter using (3) textual messages only for (4) a short duration of time—perhaps four to twelve weeks during an incipient or actual regional conflict. The Jerusalem/West Bank area fits these criteria. The aim of the experiment would be to increase communication between and among Arab and Jewish sectors on a people-to-people basis, with no filtering or selection by the news media.

The following sketch assumes that this network can be deployed with at least the reluctant cooperation of authorities on both sides of the conflict so that it need not be done surreptitiously, or in such a manner that disabling attacks on its facilities must be prevented. It must be clear to all that users of the network on either side will not be punished.

One or two deployable AM radio antennas would span a local area of 20-30 miles, depending on local terrain. The antennas should be capable of both sending and receiving signals, and would contain (or be linked to) computers whose memory could comprise an electronic bulletin board on which messages could be both posted and retransmitted.

Terminals must be developed that are battery-operated, contain an AM radio modem, and are capable of interacting with the antennas both to generate and receive text. The terminals and keyboards would be disposable, solid-state (e.g., liquid-crystal display screen and RAM), and inexpensive (perhaps \$100 each). If \$100 per terminal is realistic, and assuming 100,000 potential communicators in the conflict area with one terminal for each 100 persons, the cost for hardware for this experiment would be about \$100,000 (\$100/terminal x 1000 units); plus the cost of the reusable central antenna(s), computer, and labor necessary for any special programming requirements.

The terminal would also have to be extremely simple to operate. When a message is created, the terminal would transmit it to the central antenna and computer, where it could be retransmitted to others within several seconds. The communication protocol would be digitally encoded, with error checking and correction, and permit retransmission if error correction was not sufficient. The transmission protocol would have some combination of frequency allocation and time division multiplexing.

The development of such an experiment raises many interesting policy and technical issues that are applicable to the global vision:

- Would conflicting countries or ethnic groups allow—even reluctantly—the installation of a temporary interpersonal communication network?
- Would increased information, even straight text, within and between people in a conflict situation reduce the tension?
- What are the technical options for creating the network? Although one is sketched briefly above, many other options exist.
- How should language translation be handled? Would this process introduce the possibility of censoring or altering the messages?

There is much valuable data to be gleaned from this kind of an experiment that would lead to a specific agenda for further research. While very limited in size and scope, it is designed to deal with issues that are solvable right now. And if such an experiment were successful, future experiments could be planned with more extensive language translation challenges, or perhaps using voice and/or video forms of communication.

CONCLUSION

The concept of a global person-to-person communication network is made at least technically possible by a continuing revolution in information systems and services and our willingness to begin testing the concept by limited demonstration projects like the one proposed here. There are hundreds of unanswered questions, hundreds of policy options and considerations. Costs to implement are unknown, but much of the infrastructure may already be in place, such as CompuServe, MiniTel, cellular telephony, satellite channels, hundreds of electronic data networks linked by "gateways"—all of which should minimize any additional development required.

This novel concept—which some have labelled "information anarchy"—indicates the kinds of possibilities that might be explored. Not all, or even the majority of, studies proposed for the new information technologies should so stretch the bounds of practicality. But some should, because in revolutionary times, revolutions—in thinking, in exploration, in global understanding—are possible.

Appendix B

CONAMI: A COUNCIL FOR NORTH AMERICAN INFORMATION

by

David Ronfeldt

This appendix describes a Council for North American Information (acronym CONAMI, reflecting roots meaning "with friends"), which would analyze how the spread and application of the new information and communications technologies might affect the prospects for conflict and cooperation in North America—the United States, Canada, and Mexico. Such a regional information network would identify initiatives for improving the information infrastructures in and across North America in order to assist elites and institutions to deal collectively with issues and conflicts that may arise as the three countries become more interconnected economically, socially, politically, and militarily.

The CONAMI concept embraces the establishment of a special network, and possibly a research center, where participating elites from all three countries may obtain, share, and discuss information about key issues. Consideration would be given to all issues, including out-of-area military issues, that could disturb North American relations.

BACKGROUND

New global and regional interconnections of all types and at all levels of society are developing at an explosive pace largely because of the effects of the worldwide communication and information revolution. While the growth of global interdependence and a global economy have captured the attention of many analysts, the new world order is being defined as well by efforts at regional economic integration—notably in Europe, in Asia around Japan, and in North America among the United States, Canada, and Mexico.

In some respects the world is becoming multipolar again, but it is not likely to return to the classic balance-of-power game of nations. In all nations and regions, foreign and domestic policy issues are becoming less separable, and security issues less military; power is becoming more diffused, and sovereignty less assertable. To describe the changes, a new vocabulary about supra-, trans-, sub-, and nonnational actors is now required in addition to the customary vocabulary about international and national actors.

In this context, the regional integration efforts gaining momentum around the world all have important implications for U.S. interests. But U.S. interests in North America are magnified by two dynamics in particular. First, the future ability of nations and nation-based actors to play powerful global roles may depend heavily on success with regional economic integration. Second, nations and nation-based actors will have to contend increasingly with domestic spillover effects from their neighbors and with the related rise of transnational actors who may identify more with regional and subregional than with national interests.

What happens within and between the CONAMI countries figures to affect their interests both at home and abroad more than ever. North American economic integration is proceeding rapidly now; a U.S.-Mexico free trade agreement (FTA) may soon be added to the recent U.S.-Canada FTA. While U.S. interests in North American integration emphasize the benefits to the U.S. economy, there are also security-related stakes. There must be assurance that Mexico, which has undertaken major structural reforms, remains stable and continues to develop an open, growing economy and a more democratic political system. The resurgence of Quebec separatism also raises potential security issues for Canada and the United States.

Policy issues relating to the information revolution currently are in their infancy and low on the three countries' agendas for relations with each other, yet information issues may eventually become as significant and controversial as immigration and foreign investment issues. Trans-border information flows in the form of television broadcasts, commercial data transactions, and electronic mail have begun to touch the same sensitive nerves of nationalism that react against foreign labor and capital flows. How the new technologies are deployed and employed in, and among, the three countries will increasingly affect the growth and evolution of economic and political relations across North America—and in no small measure, the ability to resolve conflicts and promote cooperation.

While Canada and the United States have extensive modern infrastructures for taking advantage of the new technologies, Mexico must do some catching up. The modernization of its newly privatized telephone company (TELMEX) is getting underway, and its system of communications satellites (Morelos I and II) will be expanded soon with the addition of a third satellite (Solidarity) and more ground stations. While reliable high quality telephone communications and digital data transmission are not widespread, where they exist (e.g., in Mexico City), they are fairly good and connections can be made to the full range of international mail and data services. Despite these advances, Mexico's key academic and

research centers still lack electronic mail and bulletin boards, so linking Mexican participants to CONAMI would be a pioneering achievement even though it should not be technically difficult.

The Mexican government wants to make Mexico a hub for communications between Latin America and North America, Europe, and the Far East. Yet modernizing, expanding, and liberalizing Mexico's infrastructure will open up communications and information flows mostly inside Mexico and with the United States, and there is no consensus in Mexico that this is all to the good. In some government and political circles, there is concern that the new technologies may weaken centralized internal controls and expose Mexico to outside forces that would weaken national sovereignty. (Currently, all communications networks and domestic and international connections pass through switches of the Ministry of Communications and Transport.) The traditional precepts of Mexican nationalism call for proceeding cautiously and guardedly with the new technologies—even though their adoption may be essential for the country's economic restructuring and modernization.

The conditions in Mexico have been discussed in depth because, of the three countries, it presents the greatest sensitivities and challenges for initiatives to improve the information infrastructure and establish information networks and/or centers that operate independently of the central government. While Canadians resisted opening their country completely to U.S. print and broadcast media when its FTA was negotiated, the grounds for cooperation on information-related issues with the U.S. now seem well established.

THE PRIMARY TASK

The primary objective of this research would be to ascertain whether, and in what ways, a transnational organization like CONAMI could enhance communications and information flows among elites and institutions in the three countries in order to improve their ability to anticipate, define, and influence issues and conflicts that may jeopardize North American relations. New connections are developing rapidly among elites and institutions at all levels and in all sectors of all three countries, but little has been tried to net them together via the new technologies with the goal of improving cooperation.

Research is needed to identify the prospects and alternatives for creating one or more networks, and possibly one or more centers, that would use the new technologies to magnify the collective knowledge and influence of the participants. A key question is to define the most effective goals for a network. One goal may be to help the participants arrive—collectively and individually—at informed policy perspectives that transcend particular

national or private interests, and contribute to broader interests in resolving conflicts and building new patterns of cooperation. But there are many ways to approach this. For example, the network might improve communications and information flows by providing CONAMI's participants with the electronic means for discussion, but it might also endeavor to become a clearinghouse for regional information. It might even take public stands if the participants conclude that they have formulated views (a "North American view") that may contribute to resolving a conflict.

A related question is how CONAMI might be configured. Should it be loosely defined, consisting only of the network, and emphasize electronic mail and bulletin boards? Should it be formed around a single center or institute (or should there be one in each country) that would have information collection, analysis, and dissemination capabilities beyond the network?

A third question is what kinds of issues should be addressed. Perhaps CONAMI should have a basic agenda of issues to be watched, but also be able to focus intensively on specific issues or events that may erupt into conflict.

Most of the security issues within North America are nonmilitary and related to economics. For example, foreign investment, trade, debt, immigration, and environmental issues are increasingly seen to have security dimensions, and all are capable of generating conflict. Furthermore, regional (and subregional) realignments within the three countries are seen to have security (or sovereignty) dimensions. As a result of growing economic interdependence with the United States, some Canadian and Mexican states, cities, and elites in the border areas are tied more to the United States than to their own nation's economy, society, and culture—to the concern of leaders in Ottawa and Mexico City. In Washington and Mexico City, the notion is disconcerting that independence for Quebec might someday set a precedent for a separatist movement among the Spanish-speaking population along the U.S.-Mexican border.

Military security issues are not prominent within the North American area, but they sometimes arise in connection with drug trafficking, terrorism and insurgency, human rights abuses, and border control. While Mexicans are worried about the apparent militarization of the U.S. border to halt the flow of drugs and illegal aliens, the political stability of Mexico is of concern to all three countries. Looking ahead, it is expected that successful economic integration will lead to closer cooperation between the intelligence agencies and armed forces of the three countries.

Another question is who should participate: individuals, institutions, or both? Although CONAMI should be independent of governments, it may still be important to include selected government officials and/or advisers. The authors' working hypothesis is that the network should include a diverse range of elites who are united in their commitment to develop a network dedicated to resolving conflicts and enhancing cooperation throughout the North American region.

SUBSIDIARY TASKS

Several subsidiary tasks should also be explored as part of the CONAMI effort. While CONAMI focuses on North America, the subsidiary tasks will provide information on whether it is feasible to consider installing advanced communications and information networks in other regions.

One task would be to ascertain just what is the pertinent information infrastructure in the three countries of North America, and what the prospects are for enhancing it. For example, what computer networks already link elites and institutions of the three countries? How are these networks being used? How well do they operate technically? What are the participants gaining from them? Technical, institutional, and legal factors affecting the deployment and employment of the new technologies, in one country or another, also need to be examined. Installing a North American network would be partly a matter of distributing appropriate hardware and software among the participants, but assuring easy interactivity might be technically and politically difficult in Mexico.

Another task would illuminate the relationship of information to economic and political infrastructures in the three countries. In particular, data would be gathered on the current thinking (including the strains arising in traditional nationalist thinking) about how the new information infrastructures may affect (and be affected by) the integration of the countries' economies and potentially the harmonization of their political systems. Modernizing the information infrastructures may foster administrative decentralization and increasingly autonomous regional (or subregional) development *within* each country. Also to be studied would be the impact of the information revolution on the loosening federal-provincial ties in Canada, and whether a similar loosening may occur in Mexico, perhaps creating a risk of fragmentation alongside the new potential for democratization.

While it is comfortable to assume that the information revolution will have positive effects favoring democratic development and cooperation, this may not be the case. An analysis of the prospects for creating a regional security information network should take

account of the ways in which the spread of the communications and information revolution may itself give rise to new patterns of conflict as well as cooperation in North America.

A third subsidiary task is to consider the role of information factors in the generation and resolution of conflicts, in order to identify how information influence may be wielded to resolve conflicts and enhance cooperation. The world appears to be moving from a period of military influence into a new period where economic influence will be paramount, but the influence of information is also very much on the rise. New research is needed to clarify how a CONAMI-type information network or center could best acquire and exercise such influence.

On the basis of findings from these tasks, options would be proposed for designing and establishing one or more regional information networks, and possibly one or more centers around which such networks might function.

Appendix C

**SERVICE ADJUNCTS TO THE NEWS MEDIA:
A SECURITY INFORMATION DIVISION FOR CNN**

by

Carl Builder and Constance Greaser

BACKGROUND

The astonishing political events of 1989-1991 are no doubt attributable to many causes and actors, but the major role of telecommunications—by means of television, radio, video and audio tapes, telephone, and facsimile machines—is perhaps the most widely acknowledged new factor, credited with everything from being the facilitator to the instigator of the political changes ending the Cold War.

The pace and relatedness of events in Eastern Europe in 1989 strongly suggests that those publics were very well informed of events in neighboring countries and gained growing confidence that they could persevere against their communist governments with peaceful protests. The East Germans were watching West German television, and the Hungarians were watching Cable News Network (CNN) television being rebroadcast from Yugoslavia. Not only were the people of Eastern Europe able to watch outside, independent assessments of what was going on; the existence of these outside sources forced their local broadcasters to “clean up their acts” if they were to retain any credibility or audience. The most violent of the largely “peaceful” revolutions, in Romania, reportedly centered on control of the television stations. The remarkable role of telephones and facsimile machines in the events and aftermath of the 1989 Tiananmen Square confrontation has been widely described and admired.

However we may ultimately come to perceive the role of information and the information technologies in these events, two aspects of that role are likely to persist: the role was a *positive* one for the prospects of world peace and human rights, and the role was primarily about information *dissemination* (contrasted, for instance, with information acquisition or processing). If the latter assessment is correct, it begs the question of whether that positive role can be sustained and enhanced by deliberate actions to improve the

dissemination of information to all the world's people. Although the Voice of America and Radio Free Europe represent deliberate governmental efforts to disseminate information to the peoples of Eastern Europe and can claim some contribution to the events of 1989, they probably cannot compare with the credibility and impact of the commercial television programming penetrating Eastern Europe with the undeniable truth of its visual messages.

GENERAL CONCEPT

The proposition advanced here is that the positive role of information dissemination can be enhanced by deliberate actions to improve the quality and quantity of information pertinent to conflict and peace that is made available to the commercial news media, particularly for television programming (since that appears to be the most effective medium for mass dissemination). Although governments may have the best access to such information, they may not always be willing to share it for security reasons of their own, and even when they do, they may not always be credible as unbiased or forthcoming sources. Thus, one interesting potential source for such information appears to be a research service adjunct to the commercial news media devoted exclusively to supplying information on conflict and peace.

If television news organizations played a positive—although not deliberate—role in the events of 1989 by their dissemination of information to the people of Eastern Europe or from Tiananmen Square, how might that role be enhanced? The news media is clearly able to focus its reporting resources when conflicts become apparent and salient; audience interest and competition can dictate their attention to a considerable degree when violence is impending or occurring. But the news media's resources for conflict are vested in reporting more than analysis, and in the event more than the background.

For example, the television networks were able to broadcast events in real time from Tiananmen Square prior to the crackdown by the Chinese government. They could only speculate, however, about what was going on elsewhere, with much of that speculation focused on military movements in the surrounding countryside as indicators of future developments. Other governments, through their intelligence agencies, probably knew what was going on elsewhere, but would not reveal that knowledge to the media to protect their intelligence capabilities or their relations with the Chinese government. The questions that echo in the aftermath of Tiananmen Square are:

- Could an independent, media-owned intelligence agency, devoted to information on military developments and conflict, have been able to provide better information on the impending use of military force?
- Would such information, if it had been made available to the world before the event, have made any positive difference?

The answers are not obvious, nor are they likely to be forthcoming from research. An experiment or trial with such an independent agency or research adjunct is likely to reveal and prove much more than studies could.

A research service adjunct devoted to opening societies up for close scrutiny might be able to do several things that are not normally provided by the commercial news media as now constituted:

- Identify and monitor impending military developments and conflict situations which are not yet drawing news media attention.
- Undertake in-depth analyses of military developments and conflict situations where they are not available from established governmental or public institutions.
- Prepare media-ready graphics or video materials on military developments and conflict situations suitable for use by reporters.
- Maintain archives and professional contacts pertinent to military developments and conflict as a clearinghouse for reporters.

Although such activities are currently undertaken on an *ad hoc* basis by the news media, they are not typically performed on a continuous basis by military and security analysts. Reporters in the field may exploit their professional contacts in seeking information, but such interviews and exchanges are necessarily guarded because the professionals are usually affiliated with a government or an organization with commitments to other clients.

The essential thesis of this concept is that the commercial news media demonstrated, in the events of 1989, that their power to open previously closed societies may now warrant their expanded involvement in the collection, analysis, and dissemination of information pertinent to military developments and conflict—information which they now should provide for themselves by establishing their own professional sources.

SPECIFIC CONCEPT

A research service adjunct to provide the commercial news media with independent, professional sources on military developments and conflict might take one of two forms:

1. A media-wide service, such as Reuters or Associated Press, but specializing in gathering and preparing information pertinent to conflicts and peace for use by the news media, particularly for commercial television programming.
2. A subsidiary service for a specific news organization, preferably one of the television networks with a large international audience. The Cable News Network (CNN) is an obvious choice, but the British Broadcasting Company or Reuters might be alternatives with excellent reputations and broad international audiences in the radio and print media.

Of the two forms, the adjunct to a specific news organization might be the more practical to instigate because it could be designed to the needs of a specific client, with a clear source for funding, unambiguous measures of effectiveness, and an obvious consumer for its products. If such an adjunct to one commercial news organization proved effective, it would probably be copied by others.

For example, a service adjunct could be designed as a supporting division to CNN with a charter to supply competitive source materials to CNN reporters and newswriters in the furtherance of peace and the opening of societies. This support division could be staffed by professionals in the collection, analysis, and dissemination of information on military developments and conflicts. It could provide CNN with media-ready background materials for reporters and newswriters, ranging from satellite photographs to videotaped interviews with security experts. The service adjunct could be evaluated:

- quantitatively on the basis of the demands for (and use of) its services and materials by CNN for broadcasting, and
- qualitatively on the basis of its public reputation for contributions to world peace and its emulation by others.

A HYPOTHETICAL EXAMPLE

In the real world, this service adjunct might work something like this. Suppose that one of CNN's lead stories today concerns growing riots and work stoppages in Kashmir. A security analyst from the adjunct group is assigned to investigate; these assignments come from the reporter in the field, the central newsroom, or the analysis team directly.

Quickly it is learned that the labor unrest in Kashmir is another phase of the India-Pakistan confrontation and that the conflict is essentially political-religious rather than economic. Information is made available from regular sources and files, monitoring agencies, and in some cases through interviews conducted by analysts in the field, on the more exact causes of the conflict. This data might be reinforced with detailed security information, such as Pakistani troop movements in their Northern Frontier sector along the disputed border between India and Pakistan, especially around Rawalpindi. International monitoring agencies might also have evidence that there is some minor bolstering of small Chinese fortifications on the other side of Kashmir, in the Aksai Chin region in the southern part of Sinkiang Province, another area where the boundary with India has long been in question.

In this hypothetical case, CNN might decide to build an in-depth story around this data instead of simply using it to supplement the item on the labor unrest in Kashmir. But simultaneously, the information could also be disseminated to other interested stakeholders, such as other broadcast and print media which subscribe to the CNN service, governments and other official entities, especially those directly concerned in the conflict situation. An innovative approach to the dissemination might see CNN issue "white papers" from each major analyst assignment, complete with video footage, pertinent graphics, and files of data, that would be available to any interested research group.

If this kind of adjunct service was set up with the proper personnel and resources, it might eventually gain international prestige as a fair and honest expert team, so that it would increasingly be allowed complete access to the information resources within each country. Just as the Red Cross is viewed as the primary organization to contact in case of a catastrophe, this research service could be the one to call for a honest, quick assessment of a potential conflict situation. Failure to cooperate with requests from the analysts for information would carry global visibility and negative international reaction.

IMPLEMENTATION

The first step in pursuing the concept of a research service adjunct is to take the idea up in discussions with commercial broadcasters. The concept would have to be developed in further detail with those interested in implementing or supporting the idea. Since the effectiveness of such an adjunct is conjectural at this point, and because an initial trial to fairly measure its effectiveness could be a significant undertaking, partial funding on a matching-grant basis might be appropriate for the first several years.

For example, CNN and a research sponsor might put up equal shares of the estimated costs for a two-year trial. At the end of that trial, it should be clear if the concept has made a significant contribution to CNN broadcasting and the goal of promoting peace. If more the former, then CNN should assume the costs thereafter; if more the latter, other sources of support should be found to pursue the concept's objectives.

Appendix D

**A PAN-EUROPEAN SECURITY INFORMATION
AND RESEARCH AGENCY**

by

Richard Leghorn and Jeff Marquis

PURPOSE

In view of the rapid and continuing nature of the changes that the European security order is undergoing, we propose establishment of a pan-European security information and research agency, which would have a two-fold purpose:

- Initially, to contribute to the monitoring and verification of European military balances as prescribed by multinational arms control and confidence and security-building agreements;
- Of longer-range importance, to stimulate a political process leading to the development of international arrangements for deterring war and enforcing the peace in Europe and the abandonment of national security policies that rely upon war-fighting and balance-of-power strategies, or fears of massive destruction if peacetime deterrence fails.

Current national means of monitoring and verifying arms treaty compliance are unsatisfactory on several counts. Information gathered by national intelligence means and disseminated to the public may be considered partial by those who question the political motives of the acquirer and those who lack their own means for evaluating its reliability. National intelligence monitoring—in particular, on-site inspection—is an irritant to certain countries because of its intrusive nature. To them, it is simply “legalized spying,” an excuse to steal a rival’s secrets in order to achieve military or commercial advantage. Furthermore, many smaller countries do not have the technical or financial resources to support an extensive intelligence apparatus. Currently, they must either rely upon intelligence-sharing arrangements with their allies—which can be quite restrictive—or run the risk of making important national security decisions without adequate information.

It is envisioned that the concept of a pan-European security information and research agency would serve a larger purpose than monitoring and verifying the state of the military balance. Research analyses prepared by this agency would facilitate the development of a stable, safe, and more economical system for enforcing the peace in Europe. Traditionally, peace has been preserved through a balance of national war-fighting capabilities, but the new agency would instead improve the atmosphere of political trust and confidence among participating nations and reduce the efficacy of war-fighting strategies based on secrecy, surprise, and the superiority of military forces. Such a system would be centered on a concept of mutual security and include agreed-upon rules for enforcing the peace in the event that an act of international aggression¹ were committed.

BENEFICIARIES

For several reasons, the European (including the Russian republics) and North American publics have been chosen as the primary beneficiaries for this new security information and research agency. The European security order is in a state of flux and in need of institutions to enhance and complement the present structure of alliances as well as integrate the nations of eastern and western Europe and North America within a common security fold. In addition, the peoples of Europe and North America meet the political, educational, and technological requirements for using information effectively to keep the peace. (This statement is currently less true of the peoples of the Russian republics and some eastern Europeans.) For the most part, they belong to existing or emerging democracies with a commitment to the free flow of information and open political discussion. They possess a relatively high degree of literacy and awareness of political decisions impacting upon their security. Particularly in western Europe and North America, they have at their disposal a wide array of technical devices—from the telephone and television, to the facsimile machine, to computerized mail—with which to “spread the word” widely and almost instantaneously.

This is not to say that parts of the world other than Europe are less *needful* or deserving of the services of a security information and research agency. Indeed, it is hoped that a European agency would serve as a catalyst for similar organizations in other regions of

¹Aggression is defined here to mean the actual, or threatened, use of military force by one European nation against another. Intra-national violence—committed either by governments or insurgent groups—as well as transnational terrorism would fall outside this agency’s research charter. In addition, the agency would not be asked to consider unfriendly acts of a nonmilitary nature, such as cross-border pollution or economic embargoes.

the world (the Middle East or South Asia, for example). However, it is our contention that Europe currently offers the most favorable climate for the advocacy and development of such a body.

FUNCTIONS

It is envisioned that a pan-European security information and research agency would perform the following functions:

- Collect information pertinent to European security from national governments and private, nongovernmental sources (primarily the press);
- Conduct on-site, aerial, and satellite monitoring operations to supplement, or preferably supplant, monitoring operations by governments and entities of NATO (North Atlantic Treaty Organization) and the Russian republics;
- Process, analyze, and actively disseminate information relevant to the enforcement of peace in Europe;
- Perform research into rules of engagement and military force structures appropriate for the collective enforcement of the peace as opposed to national or alliance-determined warfighting capabilities and strategies;
- Procure technologically advanced systems and components to ensure the efficient collection, processing, analysis, storage, and dissemination of security-related information;
- Render a quasi-judicial service for resolving disputes relating to compliance with provisions of security treaties.

FOCUS

Initially, the focus of the proposed pan-European security information and research agency would be on the processing and distribution of essential security information received from open sources (e.g., press reports) or volunteered by national or alliance monitoring entities. Direct collection via agency-owned systems (e.g., aircraft, satellites, and on-site observers) would at first be a secondary mission. Such systems would be expected to supplement the efforts of national technical collectors, providing an independent method of assessment in the event of an international dispute over a particular military-related activity. Ultimately, however, the goal would be to supplant the role currently performed by national systems in the area of monitoring and verifying multilateral arms

control and confidence- and security-building treaties. Operations research, peace enforcement "games" and scenario analyses would be employed by the agency to establish categories of essential security information, which would provide the basis for the organization's collection efforts. The object here would be to limit the extent of collection to searches designed to uncover militarily significant violations of security treaty provisions in order to reduce the intrusiveness, expense, and difficulty of inspection activities.

As part of a new peace enforcement regime, a pan-European security information and research agency could also have a quasi-judicial function. Its duties in this area might include investigating, conducting hearings, and rendering judgments on allegations of security treaty noncompliance. While the agency would not have enforcement powers, democratically elected governments could be expected to come under considerable pressure from their publics to assent to agency decisions, given that information relating to any investigation, agency deliberations and findings would be made freely available. Informational contributions by private groups and individuals relating to the course of an agency investigation into possible treaty violations would be encouraged.

AUTHORITY

It is proposed that the pan-European security information and research agency outlined above should be chartered under the auspices of the Conference on Security and Cooperation in Europe (CSCE). This is recommended for both practical political as well as operational reasons. Europe currently lacks an international security framework to embrace the two formerly antagonistic halves of Europe (plus the United States and Canada), other than the so-far sketchily defined CSCE. One way to add "meat" to the CSCE "skeleton" would be to place this security information and research agency under the overall control of an institutionalized CSCE. It is also believed that a supranational organization, to which national governments have freely ceded a certain amount of authority in the realm of security information activities, would carry more weight than a nongovernmental body when it came to acting upon evidence of international aggression in order to enforce the peace.

FINANCIAL SUPPORT AND OTHER ISSUES

As a constituent element of the CSCE, a pan-European security information and research agency would be supported primarily through contributions of the 35 member nations that compose the conference. The size of each country's contribution would be based upon some formula to be determined by the CSCE. To catalyze formation of the agency and encourage public interest and involvement in its operations, private donations from individuals and organizations would be solicited.

A number of issues require further consideration before a more comprehensive proposal for a pan-European security information and research agency can be put on the table. Some of these are:

- How to secure a role for the agency in verifying European security agreements given the often highly specialized nature of some verification provisions as well as the probable opposition of national intelligence bureaucracies to surrendering authority to an international body?
- How to ensure the objectivity, and therefore credibility, of the agency's product given the politically charged character of its proposed operations? (This issue relates to efforts both to monitor and to verify security treaty compliance as well as to conduct research on alternative security strategies for enforcing the peace.)
- To which segments of the European and North American audience should the agency direct its efforts: governments, elites (e.g., the press, academia, research organizations), the general public?
- Can the investigative and quasi-judicial functions outlined above be combined (à la a U.S. regulatory agency) within the same supranational body without compromising its integrity, or should the latter function be the responsibility of a separate organization within the purview of the CSCE?

Appendix E

A MULTINATIONAL SATELLITE MONITORING INSTITUTION

by

Richard A. Bitzinger, Hugh De Santis, and Dana Johnson

OBJECTIVES OF THE PROPOSED STUDY

- To examine the concept of a multinational satellite monitoring institution to assess the capabilities of such an authority.
- To determine the possible contributions of such a monitoring institution to the promotion of peace and enhancement of the global environment.
- To assess the feasibility of a monitoring institution as an organizational and structural model to aid in the opening of societies.

BACKGROUND

The world is currently undergoing dramatic changes, and these changes will have profound implications for the way the West will conduct future international relations and set security policies. The collapse of communism in Eastern Europe and the breakup of the Soviet Union have greatly altered threat perceptions, and presage the emergence of a more multipolar world system. Arms control has now become a multinational concern. At the same time, potential threats emanating from new problems (such as terrorism or drugs) and other parts of the world (such as the Middle East) are forcing international actors to take a more comprehensive view of international security policy.

A new international security environment both permits and requires new initiatives for managing transnational relations. One idea whose time may have come is the concept of a multinational satellite monitoring institution for international peace-promotion, crisis monitoring, and arms control verification. A variety of nonmilitary benefits are feasible as well. These include environmental monitoring, disaster monitoring and management of relief efforts, and aids in attempts to control international terrorism and drug trafficking.

Interest in the feasibility of a multinational satellite monitoring institution or some other transnational monitoring concept as a promoter of international peacekeeping dates from a 1978 French initiative that proposed that the United Nations oversee the creation of an independent International Satellite Monitoring Agency (ISMA) to monitor international arms control agreements and crisis areas. ISMA would initially acquire imagery from civilian earth resources satellites (such as the U.S. Landsat), but eventually it would operate its own satellites. The proposal was rejected because of its projected operational costs and concerns about the dissemination of sensitive remote sensing information. In the summer of 1988, France submitted a revised version of its 1978 proposal to the Third Special Session on Disarmament. This version called for a United Nations agency to examine data from a group of international civilian satellites—not owned by the ISMA as previously proposed—which would watch for possible arms control violations and escalating military tensions between nations.

The former Soviet Union generally opposed proposals such as ISMA, but in October of 1988, Soviet Deputy Foreign Minister Vladimir F. Petrovsky presented a new position on the subject. Petrovsky told the United Nations that the USSR “support[ed] the French idea regarding a phased approach to the establishment of a multinational satellite monitoring agency.” In the same speech, he noted that “it is important to institutionalize verification,” and called for the creation of a World Space Organization (WSO), which would encourage international cooperative ventures in space. It remains to be seen what position the successor to the old USSR, the Commonwealth of Independent States, will take.

Within the U.S. Congress, the most recent interest in a multinational satellite monitoring institution has come from Congressman Robert J. Mrazek (D-N.Y.). In early 1988 he introduced legislation, H.R. 4036, to establish the Commission on International Security and Satellite Monitoring, to examine how information gathered by an international consortium of civilian remote-sensing satellites would benefit humanity through:

- studying, monitoring, inventorying, and protecting resources of the earth;
- monitoring global environmental problems;
- enhancing weather predictions;
- assisting ongoing efforts to control international terrorism and drug trafficking by monitoring suspect crop locations;

- complementing existing efforts to verify arms-reduction treaties; and
- improving crisis-control and conflict-resolution efforts.

RECENT PROPOSALS

Several concrete new proposals for multinational satellite monitoring institutions have been advanced in the last decade. The most important of these are discussed below.

A Regional Satellite Monitoring Agency (RSMA) for Europe

In order to avoid many of the problems commonly cited for an ISMA, several proposals have been floated since the early 1980s for creation of a Regional Satellite Monitoring Agency (RSMA) for Western and Eastern Europe. This agency would principally monitor arms control agreements and aid with crisis monitoring in Europe. The advantages of a RSMA over an ISMA are that since the number of participating nations would be smaller, the problems surrounding transnational dealing with sensitive data would be reduced. In addition, the infrastructure (the European Space Agency, the Interkosmos Council in Eastern Europe) and capabilities (the SPOT satellite platform, the Ariane launcher) for a RSMA are already available.

A variation on a European RSMA, proposed in the mid-1980s, called for a series of Arms Control and Conflict Observation Satellites (ACCOS) to be operated by the neutral and nonaligned states of Western Europe (Austria, Finland, Sweden, and Switzerland). An ACCOS system would consist of an international and independent satellite surveillance and verification system to monitor arms control agreements and to collect data on "crisis-sensitive areas" in order to prevent a crisis from developing into a major conflict. In particular, ACCOS would provide a "third-party" source of information on the development of nuclear arms, and the development of space weapons.

Related to the RSMA concept, the Western European Union (WEU), supported by the European Space Agency (ESA), has recently begun to look at the idea of creating its own monitoring and verification system. Initially, at least, such a system would monitor compliance with arms control agreements in which the territory of WEU states is involved. It is envisioned that, as a first step, the WEU would establish an agency that would purchase and interpret SPOT imagery. Later the agency might launch and operate its own satellites. Most significantly, the system proposed by the WEU would be run by the West Europeans themselves, exclusive of any U.S. participation.

Paxsat

In the early 1980s, Canada suggested a series of "Paxsats" to be developed and operated by countries other than the United States and Soviet Union, for the purpose of verifying multilateral arms control agreements. Two Paxsat concepts were studied. Paxsat A would be used for space-to-space monitoring of any space-related arms control agreement. Paxsat B would be used for space-to-ground observations to monitor arms control agreements surrounding "terrestrial weapons," in particular the confidence- and security-building measures laid out in Stockholm in 1986 and future conventional arms control treaties. Specific to the Canadian Paxsat study is the proposed reliance on third-party systems; no demand would be placed on U.S. or Russian remote sensing systems.

The Tellus Project

Based on an initiative that arose from a meeting between Swedish researchers and the Swedish government, in 1985 the Swedish Space Corporation was commissioned to study a third-party satellite system for verification: the "Tellus" Project. The objectives of the study were to analyze the performance, costs, and usefulness of such a system as a component in an overall multinational regime (including on-site inspections, etc.) for verifying agreements on arms control and for other confidence- and security-building measures, particularly in Europe. In particular, such a satellite would operate basically as an "alarm system," indicating a possible breach of an agreement.

As with the RSMA concept, the Tellus study argued that most of the needed infrastructure and technology was already in place or available, and in particular that Sweden possessed "the necessary technical expertise and industrial capacity in this field." Such a satellite could be launched within six years of the project start-date, as early as the mid-1990s, at a cost of \$400 million to build and launch and \$13 million annually to operate.

International Satellite Imagery Data Center

An alternative to an international monitoring system with dedicated satellite sensors is the exploitation of existing resources by an international satellite imagery data center for the purposes of independent verification, crisis monitoring, confidence building, and international assistance efforts. Any international or multilateral monitoring regime would require some type of central database or center, where gathered information could be

collected, analyzed, catalogued, archived, and disseminated. This center would collect and analyze data from existing or future unclassified sources—SPOT, Landsat, KFA-1000, RADARSAT, etc. This is close to the 1988 French proposal updating their International Satellite Monitoring Agency (ISMA) concept.

One likely advantage of this over other proposals is cost; a center that uses the remote sensing systems of others would be cheaper to operate than one with dedicated satellites. The scheme would also avoid reliance upon any one type of sensor since the center would have at its disposal a variety of different sensors. Such a center would serve mainly as a central clearinghouse for the collection, interpretation and analysis, storage, and dissemination of space-gathered information for a variety of purposes. Depending on its relationships to national governments, the center might also be able to use systems or imagery that are currently classified.

ENVIRONMENTAL MONITORING FROM SPACE

Another issue of international security, broadly construed, receiving renewed attention within the scientific community and the general public is the global environment and the interaction of human activities with the Earth's "biosphere." Pictures of Earth, taken from space by astronauts, as well as data gathered by remote sensing satellites (such as Landsat and SPOT), have contributed to this sparking of interest. The growth in a variety of space-based technologies which monitor critical physical, biological, geological, and chemical trends on a regional or a global scale is enabling scientists to develop techniques to predict changes in the Earth's environment. Consequently, an understanding of the total integration of the "Earth system" and man's role in that system is increasing.

The world is faced with a range of environmental problems, including changes in global atmospheric composition—the so-called "greenhouse effect;" ozone depletion, due to CFCs (chlorofluorocarbons) and other causes; tropical deforestation, which is particularly acute in the Amazon rainforests of Brazil; and the encroachment of desertification, especially in Africa. Recognition that something needs to be done about these problems has resulted in a number of international efforts. One of these is the NASA-run Mission to Planet Earth (MPE) program. Other efforts for the early 1990s include:

- the European Space Agency's Remote Sensing Satellite (ERS-1) images the oceans, coastal waters, ice fields, and land masses in all weather conditions;
- the joint U.S./French ocean topography mission TOPEX/POSEIDON to monitor ocean currents;
- the U.S. Upper Atmosphere Research Satellite, which will measure the atmosphere's chemical elements;
- Japan's Earth Remote Sensing Satellite, which will gather data for agricultural and forestry resources management; and
- Canada's RADARSAT, which will study the Arctic and Oceans.¹

Italy, India, and other nations are also conducting research and developing satellite programs, both independently and jointly with NASA. In addition, there is international cooperation for the 1992 International Space Year (ISY) which commemorates the 500th anniversary of Columbus' discovery of America. ISY will be similar to the 1957-1958 International Geophysical Year. The planning, coordination, and data gathered by Mission to Planet Earth and ISY will be utilized in preparing for the International Geosphere-Biosphere Global Change Program which will be undertaken as an open-ended, broad international assessment of Earth's environment.

In contrast to the "military" proposals discussed above, environmental monitoring provides clearly defined objectives and attracts participation at all levels, from scientists to the general public, to foundations, up to governments and multinational organizations. Furthermore, while the emphasis of this particular discussion is on the exploitation of space-based remote sensing capabilities, there are alternative ground-based environmental monitoring systems and technologies which also offer exciting investment opportunities.

POTENTIAL POLICY ISSUES

Despite the apparent interest in a multinational satellite monitoring institution, a number of economic, technological, legal, managerial, and political impediments to actually inaugurating such a system remain.

¹James D. Baker, "Mission to Planet Earth," *Aerospace America*, July 1988, pp. 44-46.

- The costs for such a space-based system, depending upon whether it involved dedicated sensors, could be enormous; even a government-sponsored international organization might find the benefits of such an operation insufficiently cost-effective to justify it.
- Using existing sensors might also prove difficult as non-U.S. remote sensing operations currently insist on retaining the copyright to their data; this could complicate the idea of the free use of data for verification and other purposes. Furthermore, within the United States, official encouragement of the growth of a commercial remote sensing industry runs at cross-purposes to the traditional position of "reasonable access" to unclassified data: as with so many other relevant issues, this remains to be decided.
- It is still unclear what specific system-level capabilities such an institution might require for carrying out arms control verification, crisis monitoring, and other functions with a reasonable level of confidence. The resolution of imaging accuracy required depends on the type of target to be sensed. How much "detectability" is both necessary and possible?
- Such a system would also have to deal with the contentious issue of intrusiveness. Many countries, particularly developing nations, often do not want other states (especially those in the "first world") to have the ability and right to conduct remote sensing of their territory without prior permission for each specific case.
- The impact and influence a multinational satellite monitoring institution could actually have in any verification or confidence-building regime is uncertain. What "powers" might such an agency have to respond to potential violations it might detect? What sort of compliance/enforcement mechanisms may or may not be appropriate to both the arms control agreement and the "neutral" agency? Certainly not all nations would respond the same way to the release of potentially damaging information about their actions, especially if the information were to come from an organization to which they belong and are presumably making financial contributions.

RESEARCH AGENDA

The research agenda for addressing the potential feasibility and contribution of a multinational satellite monitoring institution might be developed as follows.

1. *Proposal Status:* A preliminary step would be to examine recent proposals and studies for a multinational satellite monitoring institution (RSMA, Paksat, Tellus, etc.) and to identify other concepts still in their formulation stage. Individual proposals, their purposes, systems, technologies, areas of coverage, and sponsoring organizations would also be identified. Additionally, various organizational, economic, technological, legal, managerial, and political problems to be encountered in realizing such institutions would be explored. The objective is to understand the motivation behind these proposals, why none have been accepted and/or implemented, and how they might be structured and argued to become accepted.
2. *Proposal Evaluation and Assessment:* An objective determination of such institutions' technological virtues and utility with regards to monitoring capabilities, international peace promotion, and environmental monitoring is necessary. Consequently, a set of measurement criteria would be developed in order to evaluate each proposal within a common framework. Measurement criteria might also include a list of key questions addressing the "ideal" goals and objectives. Proposed multinational satellite monitoring institutions might then be examined to determine their organization, managerial, operational, and technological utility as part of a program of high-leverage investments in modern information technology.

Appendix F

A PRIVATE TRANSNATIONAL INSTITUTION TO EXPLOIT COMMERCIALY AVAILABLE SATELLITE IMAGERY

by

Marc Dean Millot

OBJECTIVES OF A PROPOSED INSTITUTION

- Collect, analyze, and disseminate commercially available satellite imagery to promote international peace and prevent conflict.
- Make readily available to decisionmakers, opinionmakers, researchers, and the public around the world imagery-based analysis currently dominated by a few national governments.
- Organize, rationalize, and sustain what are today *ad hoc* and *post hoc* private efforts to exploit commercially available satellite imagery in support of international studies.
- Demonstrate the utility of International Satellite Monitoring Agency (ISMA) concepts to national governments.

BACKGROUND

While national governments have discussed ISMA proposals for nearly a decade, in the last few years private individuals or institutions have used commercially available satellite imagery to support their efforts to describe, analyze, and change international security policies.

In 1987, two analysts at the Norwegian Institute of International Affairs, with support from The Ford Foundation, used imagery obtained from the U.S. Landsat satellite to analyze Soviet military facilities on the Kola Peninsula. The work provided the unclassified research community with a view of Soviet military operations previously available only to those holding security clearances. For example, their research identified and described in detail two major bases previously unrecorded in open sources.¹

¹Tomas Ries and Johnny Skorve, *Investigating Kola: A Study of Military Bases Using Satellite Photography*, London: Brasseys, 1987.

In March of that same year, the Space Media Network, a private Swedish company, released images from the French-owned Satellite Pour l'Observation de la Terre (SPOT). These pictures clearly showed the controversial Soviet radar at Krasnoyarsk, which was widely considered a violation of the U.S.-Soviet Antiballistic Missile Treaty. Later, U.S. television aired the SPOT images of the radar, and the ABC television network aired an interview with Peter Zimmerman, a physicist specializing in arms control issues at the Carnegie Endowment for International Peace, to explain their meaning and significance. After several such releases of SPOT imagery, the Soviet government finally invited U.S. Congressmen and a delegation of defense analysts to inspect the facility; eventually they agreed to dismantle it.²

Soviet officials first denied to the world media that a major nuclear incident had occurred at Chernobyl in 1987, then attempted to downplay the disaster. But the SPOT and Landsat imagery being used by the major media and specialized publications to cover the story was making the scope and scale of the incident quite evident. The Soviet government gradually became more open about the shortcomings of its nuclear power program and started releasing information about the events leading up to Chernobyl.

In his 1988 book on the spread of nuclear weapons, *The Undeclared Bomb*, Carnegie Endowment analyst Leonard Spector used SPOT imagery to help confirm the existence of Pakistan's Kahuta uranium enrichment facility.³ The evidence was an important element in making the existence of a Pakistani nuclear weapons program credible to the world community.

A 1989 study conducted by the Carnegie Endowment demonstrated that currently available commercial satellite imagery could be used to identify many military facilities or capabilities in either a general or precise way. Radars, supply dumps, major headquarters, airfield facilities, aircraft, rockets and artillery, missile sites, surface ships, and surfaced submarines could be identified from imagery supplied by SPOT or Landsat.⁴ The analysis of such images conducted by private firms supporting the study suggested that even more information could have been gleaned from the images, given additional time and funding.⁵

²See Ann M. Florini, "The Opening Skies: Third Party Imagery and U.S. Security," *International Security*, Fall 1988, p. 103; and Peter D. Zimmerman, "Remote Sensing Satellites, Superpower Relations, and Public Diplomacy," in Michael Krepon et al. (eds.), *Commercial Observation Satellites and International Security*, New York: St. Martins Press, 1990, p. 37.

³Leonard Spector, *The Undeclared Bomb*, Cambridge: Ballinger, 1988.

⁴Peter D. Zimmerman, "Introduction," in Krepon, *ibid.*, pp. 203-204.

⁵William A. Kennedy and Mark G. Marshall, "Observing a French Nuclear Weapons Deployment Area," and Donald Vance and William Bumbera, "Imagery Analysis and Installations of Ground Forces" in Krepon, *ibid.*

The idea of a satellite imagery system specifically designed with the needs of the news media in mind has already been proposed. "Mediasat" has been the subject of at least one technical memorandum by the U.S. Office of Technology Assessment.⁶ EOSAT, the U.S. company that markets Landsat imagery, has attempted to interest the media in a system called STAR (for "Satellite Tracking and Reporting"). STAR would have a five-meter resolution, accurate enough for journalistic and other types of news gathering. EOSAT proposed that the STAR system be orbited with Landsat VI, but the lack of interest by the media in this project caused EOSAT to delay STAR until Landsat VII, currently planned for a 1994 launch. Working in Mediasat's favor, however, is that Congress, which is funding the Landsat VII feasibility study, has mandated that this satellite both incorporate the most advanced sensing technology available and be commercially viable.

The private release of imagery-based information, previously available only to select members of a few countries' national security communities, offers opportunities to profoundly alter the nature of international order and conflict. When such imagery was available only to a few government officials, they acquired great power to set the news agenda and influence public opinion. By releasing U-2 (a U.S. high-altitude surveillance airplane) photographs of Soviet missile emplacements in Cuba, President John Kennedy provided the international community with tangible evidence of Soviet efforts to secretly alter the strategic balance (by basing Soviet missiles capable of targeting much of the United States in Cuba). We do not know specifically the imagery governments have chosen to withhold over the years, but in keeping their knowledge secret, governments also exercise a power not to make that knowledge a political issue. Now such power has become available to private institutions or even individuals able to pay for commercially available images and supporting analytical services.

The examples described above suggest the possibilities for a permanent private institution devoted to the exploitation of commercially available satellite imagery to promote international peace. This institution would draw on the imagery available from commercial vendors for SPOT, Landsat, and other satellites. It would supply imagery-based analysis and services on issues related to international peace to opinionmakers, decisionmakers, researchers, and the general public around the world. This transnational institution would demonstrate, by its ongoing operation, the utility and feasibility of the various ISMA proposals.

⁶*Commercial Newsgathering from Space, A Technical Memorandum*, Congress of the United States, Office of Technology Assessment, Washington, D.C., 1987.

MAJOR ISSUES FOR EXPLORATION

Technical Issues

Experience gained over the last several years points both to certain conclusions about the potential technical feasibility of such an institution and to several areas of future research:

- Past efforts have demonstrated the kinds of military facilities and capabilities that can be detected, identified, and described using existing commercially available imagery and analytical capabilities. This experience has also shown that imagery must be combined with other sources of information and knowledge to be made relevant to the international community. There is a need for further research into the synergies or value of more intensive and sustained monitoring of such targets in combination with other sources of information and knowledge.
- Commercially available satellite imagery has been used to support research in the areas of arms control, chemical and nuclear weapons proliferation, and the environment, and might be used to monitor possible conventional conflicts. No analysis has been conducted to determine which area might gain the most from the sustained use of such imagery.
- Prior efforts suggest in a general sense the constraints on the availability and timeliness of satellite imagery imposed by the commercial imperatives of private firms supplying and analyzing such images. There is a need to gain experience in the use of commercially supplied satellite imagery as the critical centerpiece of an ongoing public information operation.
- Recent events show that the media and the research communities are interested in, and will use, commercially available satellite imagery to support their own work. Research should be conducted into the means or channels by which imagery-based products and analysis could become a routine source of information for the institutions.

Policy Issues

The experience of the last several years also raises several important and related policy issues pertinent to the development of a private institution exploiting satellite imagery for peace.

First, what are the political limits on the availability of commercially supplied satellite imagery? SPOT, Landsat, and the Russian Soyuzkarta imagery are produced by satellites under national ownership and control. U.S. legislation and Russian policy place actual or potential restrictions on imagery from certain locations. The French government has not yet imposed any locational restrictions on SPOT imagery, but there are no rules prohibiting it from doing so in the future. A transnational institution that made imagery the centerpiece of its activities would be dependent ultimately on the willingness of national governments to supply it with imagery. The motivations and concerns of these governments as they relate to the release of imagery need careful review to assess the political risk associated with the institution's dependence on the existing and potential sources of imagery.

A second major policy area concerns the effect the release of analyses based on commercially available imagery might have on international military, political, economic, or other types of conflict and, in particular, crises. Democratic countries believe in freedom of the press as an inalienable right and a basic condition of a free society, and a private institution using and releasing commercially available imagery would seem to be consistent with that philosophy. However, if knowledge is political power, it is the power to influence or change political outcomes. In certain circumstances, this influence may be helpful to the cause of peace; in others, it may be harmful. The media have had a role in the outcome of prior conflicts. For example, by bringing the Vietnam War into the living rooms of Americans and by demonstrating the breadth and commitment of the anti-war movement to the international community, television certainly had an influence on the conduct and outcome of that conflict. Attitudes about the positive or negative influence of the media in that conflict may well depend on one's views towards the war itself. The special influence of information and analysis based on satellite imagery should be assessed from both an objective and a normative perspective.

Another policy area concerns to whom and by what standard such an institution is held accountable for its activities. The governments that control much of the existing satellite imagery must answer to their people and/or their fellow governments. Reactions of other governments and assessments of what the people (through their representatives or as demonstrated by their use of the ballot) will condone or tolerate guide decisions about the use of information controlled by national governments. Private institutions in the information business are accountable to their shareholders and the national laws of the countries in which they operate. Transnational institutions drawing on support from around the world and supplying information on a global basis must deal with competing loyalties

and policies. The news media ultimately can rely on the profit motive for guidance, although that involves assessments of the monetary value of such things as a reputation for reliability, objectivity, and independence. An institution devoted to the promotion of peace and the prevention of conflict must ensure that its standards are reflective of values widely held outside itself, and create mechanisms that foster accountability for its activities.

RESEARCH AGENDA

There is a need to build on the research and experience of the last several years to assess the feasibility of private transnational institutions exploiting satellite imagery to promote peace and avoid war. Further research and analysis should be undertaken in the following areas:

- An assessment of the kinds of peace research activities that could be supported at various levels of funding. This would involve identifying the financial costs of commercially available satellite imagery and interpretation, analyzing alternative approaches to the use of imagery, and assessing the kinds of “targets” that might be imaged to support the analysis of arms control, nuclear and chemical weapons proliferation, regional conflicts, and environmental problems.
- A detailed assessment of the information that could be gleaned from commercially available satellite imagery, using existing interpretation capabilities.
- A review of the appropriate sources of funding, legal barriers, sponsorship options, and alternative ways of organizing the institution’s operations.
- A market study of the institution’s potential products and services.

Appendix G

**POTENTIAL LEGAL ISSUES AND TRANSBORDER
DATA FLOWS**

by

Peter Jacobson

The subject of information gathering and dissemination on a global basis has gained increasing attention from legal scholars with the advance of information technologies such as international satellite monitoring capabilities. In particular, the concept of transborder data flows (TBDF) has raised a number of interesting, and largely unresolved, legal questions about the information transfer rights and responsibilities of governmental and non-governmental organizations.

When information technology could be constrained within a nation's borders, most legal issues were domestic (or bilateral) and of limited concern under international law. The ability to transmit information over increasingly wider areas (the so-called spillover effect) or to transmit information by satellite directly to a particular country (perhaps against that country's interests) necessarily involves more complex international legal questions. Yet the technology is ahead of the international legal order. In a word, the law is still local (based on differing national regulations), while the technology is universal. As one commentator put it, most of the legal issues involving TBDF arise because TBDF operates under competing national jurisdictions in the absence of a coherent international information law regime.

A preliminary review of emerging international law regarding information technologies suggests that no cohesive body of international communications, information, or space law exists. Despite considerable discussion about formulating such a coherent framework, little international consensus has emerged. The proposed research agenda presents an opportunity to reorder the legal debate by focusing on a wide range of possible legal/regulatory strategies for maximizing the production and dissemination of information. How the laws and regulations are ordered and determined can have an enormous impact on the type of information collected and disseminated, as well as on how new technologies are integrated into the existing telecommunications framework. The lack of an integrated

telecommunications/information regime can thus be seen as an opportunity to develop a framework that facilitates rather than impedes the collection and dissemination of information.

In the ensuing research, two related questions should be considered: what international legal framework will maximize/facilitate information transfers (that is, what is the likely effect of differing laws and regulations); and, within that international legal framework, what specific organizational structures should be devised to take maximum advantage of emerging information technologies and legal requirements?

What follows is an effort to raise important legal questions that must be addressed. It is largely a summary of the current state of the law rather than a blueprint of what changes ought to be made. The extent of the legal issues to be considered is a function of the organization exploiting modern information technologies, its governmental or private status, and the scope of its activities. As described below, different legal issues are presented based on an organization's functions in information gathering or news dissemination.

FREE INFORMATION FLOWS VERSUS NATIONAL SOVEREIGNTY

Perhaps the most salient legal issue is the conflict between the free flow of information and the right of a nation to protect its sovereign interests. Several general international agreements, such as Article 19 of the United Nations Charter, the Uniform Declaration of Human Rights, and the Helsinki Agreements, guarantee the right of individuals to receive information without interference from any government or non-governmental source. The free flow of information and access to data are considered to be fundamental human (that is, individual) rights, but are treated very differently across nations.

At the same time, it is generally recognized that nations have the right to project their national sovereignty (including their cultural identity) and national security. For example, governments surely are entitled to maintain national security secrets and prevent their unauthorized collection or dissemination—but what might be secret in one country is open and available in another. In short, the basic conflict is that domestic law is designed to protect national sovereignty, privacy, and intellectual property rights, while TBDF is designed to maximize the free flow of information and data. Further complicating this issue is the regulation of communications by national laws as opposed to a uniform international legal regime.

It seems clear, however, that the debate has been resolved in favor of open skies as opposed to protecting sovereign rights. Although the receiving nation can certainly attempt to jam or otherwise interfere with information gathering technology, it has no right to prevent the activity from occurring.

CONTENT RESTRICTIONS

A second general legal issue deals with content restrictions and prior national consent to information dissemination. For at least the past 15 years, nations have attempted to reach general consensus on the extent to which a receiving nation can impose content restrictions (similar to prior restraints in U.S. law) or require prior consent to TDBF or direct broadcast satellite (DBS) activities. No international consensus has formed yet because the sending nations (mainly the developed world) oppose such restrictions, while the receiving nations (generally developing nations and the former communist bloc) favor such restrictions for cultural and economic reasons. The unsuccessful attempt by developing nations to form a new world information order through UNESCO (the United Nations Educational, Scientific, and Cultural Organization) that would permit each nation to impose such restrictions suggests the difficulty of creating an international communications consensus.

CHOICE OF LAW

A third issue of general importance is the jurisdictional question of choosing which law should apply for resolving disputes. In all likelihood, the key to developing a stable international framework lies in answering jurisdictional questions. As it stands, conflicting national regulations inhibit the free flow of information. Since there is no internationally approved mechanism for resolving such disputes, it will be difficult to devise a coherent legal framework to regulate information technologies. These disputes may arise in several ways. Suppose, for example, a message is generated in country A, switched in B, stored in C. Whose law applies in the event of a dispute? To take another example, whose law applies if a receiving nation challenges SPOT satellite observations? One nation's regulations may conflict with those of other nations—or international law may conflict with national laws.

The choice of law problem is much more apparent for a transnational than for a supranational body because the supranational organization can determine how disputes will be resolved among its signatories while a transnational body must consider any number of bilateral choice-of-law problems. Of course, even a supranational organization may have a jurisdictional problem if a conflict arises with a nonsignatory state or organization. For a transnational entity, the most difficult jurisdictional problem is likely to occur if it is operating legally under international law but is in violation of the laws of the nation in which it is registered. An organization is subject to the domestic laws and regulations of the nation in which it is registered. A national licensing system thus serves the licensing state's interests, but any restrictions may not be consistent with international laws favoring the free flow of information.

A closely related question is how a receiving country could obtain jurisdiction over the sending country, especially where the two states have differing notions of how to regulate the activity. As media satellite operations expand, jurisdictional conflicts (or attempts by receiving states to obtain jurisdiction) will increase. Unfortunately, there appears to be little general international legal consensus on how to resolve these conflicts resulting from TBDF.

ACCESS TO GLOBAL COMMUNICATIONS NETWORKS

Underlying some of these legal problems is the disparity between nations in technological sophistication and access to satellite transmissions. Where a nation stands on TBDF and DBS is largely a function of whether it is a sending or receiving nation. Access to limited satellite orbits and radio frequencies is thus an ancillary issue that must be considered. Currently, the limited geosynchronous orbiting space is regulated through INTELSAT and the International Telecommunications Union (ITU). Most importantly, the ITU regulates access to the geosynchronous orbit and associated radio frequencies. Based on the World Administration Radio Conference (WARC) convened in 1985 and 1988, each nation is guaranteed at least one orbital slot. This allocation could be important in determining where to register a transnational organization or in determining which nation should be responsible for the satellite within a regional or supranational organization. Any such institution will need to adhere to INTELSAT and ITU regulations to secure such access.

STRUCTURAL LEGAL ISSUES

The primary legal advantage of a supranational (or international) organization is that the signatory nations can agree in their charter on many of the contentious legal (particularly jurisdictional) and technical issues presented by TBDF. This seems to be the approach taken under certain European regional agreements, such as in the "green paper" on European radio and television in EEC (European Economic Community) countries. An agreement to join a supranational organization clarifies the relationship between the organization and the signatory nations. Just as important, a supranational organization is likely to establish an internal mechanism for resolving disputes between nations or between a commercial venture and the organization.

For a transnational organization, the primary legal advantage is that it requires no consensus among nations to operate, but is simply subject to the domestic laws in the country where it is chartered. Under this structure, there is little need to worry about member sovereignty because the primary purpose is to disseminate information across borders. Unless certain treaties or international conferences attain the status of international law, the organization need not worry about contravening such agreements. As discussed below, however, it is important to take cognizance of a nation's domestic laws before registering there.

In either case, the organization will need to establish operating rules for maintaining confidentiality and accountability, that is, for information controls, security, and safeguards. Who has access to what information under what circumstances needs to be clearly established. Most importantly, for a supranational or regional organization, rules are necessary to determine under what circumstances a signatory nation can block the dissemination of information or when a country can limit access to information collected about it.

Whatever the organizational structure, two different sets of legal issues are likely to arise: information collection and dissemination. Even if the organization does not gather information itself, but merely receives it through recognized channels, it is likely to be subject to national and international rules on information gathering. And since the primary purpose of the organization will be to disseminate information, it will be subject to any rules on information dissemination.

REGIONAL INFORMATION NETWORKS

To the extent that the proposed research focuses on regional arrangements, it is important to consider such arrangements in the context of other regional agreements. Given the range of agreements now operating within the EEC, any regional arrangement focusing on Europe must review the relationship of the organization to existing structures and outstanding obligations. To take one example, the 1984 publication entitled "Television Without Frontiers" is an extensive document on establishing a common market for satellite and cable broadcasting.¹ Any regional arrangement should be cognizant of both the domestic laws of each participant as well as any regional compacts already established. The important legal question is how best to structure the organization to maximize its information collection and dissemination activities.

INFORMATION COLLECTION

The right to gather news is a precept of customary international law. Once again, the legal question is which law applies: (1) international law; (2) the law of the receiving state; or (3) the law of the state where the satellite is registered. Although the answer is somewhat ambiguous and should be considered in greater detail during any proposed studies, the general answer is that the Outer Space Treaty of 1967 is likely to govern information collection activities. This treaty requires that the activities of private entities in space be authorized and supervised by the nation in which the satellite is registered; however, the activities of foreign entities cannot be so regulated. Once again, the national system of regulation limits the ability of a nation to protect the collection of sensitive information.

Under the Outer Space Treaty, freedom of space takes precedence over national sovereignty concerns, so sovereignty does not extend into airspace occupied by satellites. Thus, information collection, as opposed to dissemination, is not barred by state sovereignty under the Outer Space Treaty. Nevertheless, national security concerns are likely to be the most prominent objections to expanded use of media satellites.

An important consideration in deciding where to locate an organization is the nature of domestic restrictions on information gathering and dissemination. Many countries deny the right to gather news, and others impose severe restrictions. Various national laws regarding information gathering should be considered during the proposed projects. In

¹Commission of the European Communities, *Television Without Frontiers: Green Paper on the Establishment of the Common Market for Broadcasting, Especially by Satellite and Cable*, Brussels, 1984.

particular, if a regional agency is being considered, a review of each participating state's laws on information collection (and dissemination) would be appropriate.

INFORMATION DISSEMINATION

Collecting information is one thing; disseminating it is quite another. Even if there are no adverse consequences from collecting military secrets, releasing that information to an adversary will have altogether different consequences. Concerns may range from providing inaccurate information to providing accurate information that forces the host government to respond. Are there any extant international rules to prevent such dissemination? Do these rules depend on the form of the dissemination?

Most of what has been written about information dissemination concerns intellectual property (such as disseminating copyrighted material without appropriate remuneration) and publishing national security information (that is, by a person or organization within the host country). In the research examples, the primary concerns are likely to be the publication of national security information about a nation that lacks jurisdiction over the organization and the effects of any international regulations on information dissemination.

As an adjunct to the Outer Space Treaty, the United Nations General Assembly adopted general principles guiding remote sensing activities in 1986. Because it is not clear to what extent these principles constitute customary international law, they should be reviewed to determine any effects on information dissemination. For example, Principle XII guarantees the right of the receiving state to have access to the data collected and analyzed, while Principle XIII allows the receiving state to request consultations with the sending state. Even so, the receiving state cannot deny dissemination of the information collected or analyzed, and the receiving state does not have the right to review the information before it is disseminated to other parties or nations.

THE CONSEQUENCES OF INFORMATION COLLECTION AND DISSEMINATION

Although the research projects are likely to focus on broad conflict resolution issues, there are several potential tort liabilities that should be considered as the projects proceed. The collection and dissemination of information can have adverse consequences to both individuals and nations. Suppose, for example, that the disseminated information is inaccurate, improperly interpreted, or false. What liabilities might result to the organization and the nation in which the organization is registered? For individuals, privacy rights can be invaded, copyrighted material can be unlawfully used, or individuals can be defamed

through media broadcasts. Other nations are likely to claim damages as a result of the erroneous information. To the extent that damages can be shown, the supervising nation is liable for compensation under international law for the damages incurred (whether from governmental or commercial activity).

Another important consequence of collecting and disseminating information is a potential charge of espionage when national secrets are divulged through information collection activities. The line between espionage and legitimate information collection, however, can be vague and not easily subject to standards and guidelines. In the United States, for example, the right to gather news can be limited by a compelling state interest, most often exercised in national security situations. Thus, in the Morison espionage case,² the defendant was convicted for releasing classified information even though the information did not appear to harm U.S. security interests. Although international law ideally favors the free flow of information, the Morison case suggests that national security interests remain a powerful constraint on that ideal.

²Morison v. United States, 844 F.2d 1057 (4th Cir. 1988), cert. denied, No. 88-169, 1988.